

=> FILE REG

FILE 'REGISTRY' ENTERED AT 12:59:48 ON 23 FEB 2010  
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.  
PLEASE SEE "HELP USAGETERMS" FOR DETAILS.  
COPYRIGHT (C) 2010 American Chemical Society (ACS)

=> DISPLAY HISTORY FULL L1-

L1 FILE 'LREGISTRY' ENTERED AT 11:46:55 ON 23 FEB 2010  
STR

L2 FILE 'REGISTRY' ENTERED AT 11:51:00 ON 23 FEB 2010  
33 SEA SSS SAM L1

L3 FILE 'LREGISTRY' ENTERED AT 11:51:26 ON 23 FEB 2010  
STR L1

L4 FILE 'REGISTRY' ENTERED AT 11:53:50 ON 23 FEB 2010  
50 SEA SSS SAM L3  
L5 2099 SEA SSS FUL L3  
SAV L5 ALE586/A

L6 FILE 'LREGISTRY' ENTERED AT 11:58:04 ON 23 FEB 2010  
STR L3

L7 FILE 'REGISTRY' ENTERED AT 11:59:38 ON 23 FEB 2010  
30 SEA SUB=L5 SSS SAM L6

L8 FILE 'LREGISTRY' ENTERED AT 12:00:02 ON 23 FEB 2010  
STR L6

L9 FILE 'REGISTRY' ENTERED AT 12:02:00 ON 23 FEB 2010  
30 SEA SUB=L5 SSS SAM L8

L10 FILE 'HCA' ENTERED AT 12:05:13 ON 23 FEB 2010  
20549 SEA LEVY ?/AU  
L11 426 SEA HAARER ?/AU  
L12 2 SEA L10 AND L11  
L13 147977 SEA (TIME# OR TIMING# OR TIMER?) (3A) (TEMP# OR TEMPERATUR?  
OR THERMOMET?)  
L14 14382 SEA (VALENC? OR THERMO? OR THERMAL? OR HEAT? OR WARM? OR  
HOT# OR HOTTER?) (3A) ISOMER? OR THERMOISOMER?  
SEL L12 1-2 RN

L15 FILE 'REGISTRY' ENTERED AT 12:12:01 ON 23 FEB 2010  
11 SEA (112440-47-8/BI OR 115755-82-3/BI OR 126935-36-2/BI OR  
L16 1 SEA L15 AND L5  
L17 10 SEA L15 NOT L16

FILE 'HCA' ENTERED AT 12:15:15 ON 23 FEB 2010

L18           6 SEA L16  
L19       2165 SEA L5  
L20           9 SEA L19 AND L13  
L21       52 SEA L19 AND L14

FILE 'LREGISTRY' ENTERED AT 12:23:27 ON 23 FEB 2010  
L22           STR L8

FILE 'REGISTRY' ENTERED AT 12:30:22 ON 23 FEB 2010  
L23           13 SEA SUB=L5 SSS SAM L22  
L24       283 SEA SUB=L5 SSS FUL L22  
          SAV L24 ALE586A/A

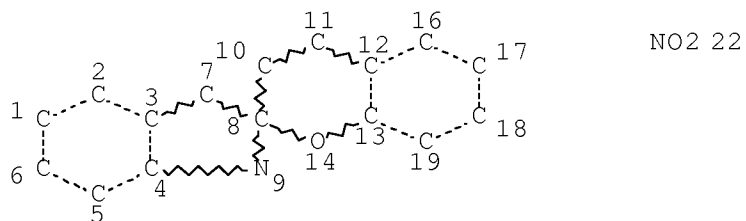
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L25           STR L3

FILE 'REGISTRY' ENTERED AT 12:34:52 ON 23 FEB 2010  
L26           0 SEA SUB=L5 SSS SAM L25  
L27       16 SEA SUB=L5 SSS FUL L25  
          SAV L27 ALE586B/A

FILE 'HCA' ENTERED AT 12:37:24 ON 23 FEB 2010  
L28           5 SEA L27  
L29       119 SEA L24  
L30       119 SEA L29 NOT L18  
L31           6 SEA 1808-2004/PY,PRY,AY AND L18  
L32       107 SEA 1808-2004/PY,PRY,AY AND L30  
L33           1 SEA L20 AND L21  
L34           9 SEA L33 OR L20  
L35       51 SEA L21 NOT L34  
L36           3 SEA 1808-2004/PY,PRY,AY AND L34  
L37       44 SEA 1808-2004/PY,PRY,AY AND L35  
L38       5766 SEA THERMOCHROM? OR (THERMO? OR THERMAL? OR HEAT? OR HOT#  
          OR WARM? OR TEMP# OR TEMPERATUR?) (2A)CHROMIC?  
L39       103 SEA L19 AND L38  
L40           5 SEA L32 AND (L38 OR L13 OR L14)  
L41           5 SEA L39 AND L37  
L42           8 SEA L36 OR L41  
L43       39 SEA L37 NOT L42  
L44       98 SEA L39 NOT (L42 OR L43)  
L45       83 SEA 1808-2004/PY,PRY,AY AND L44  
L46       102 SEA L32 NOT L40

FILE 'REGISTRY' ENTERED AT 12:59:48 ON 23 FEB 2010

=> D L24 QUE STAT  
L3           STR



NODE ATTRIBUTES:

DEFAULT MLEVEL IS ATOM

DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:

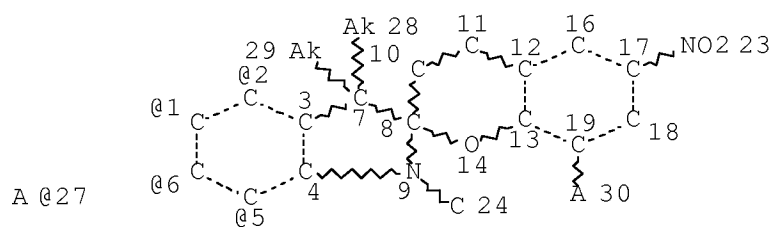
RSPEC I

NUMBER OF NODES IS 19

STEREO ATTRIBUTES: NONE

L5 2099 SEA FILE=REGISTRY SSS FUL L3

L22 STR



VPA 27-2/1/6/5 U

NODE ATTRIBUTES:

NSPEC IS RC AT 24

NSPEC IS RC AT 27

NSPEC IS RC AT 30

CONNECT IS E1 RC AT 28

CONNECT IS E1 RC AT 29

DEFAULT MLEVEL IS ATOM

GGCAT IS SAT AT 28

GGCAT IS SAT AT 29

DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:

RSPEC I

NUMBER OF NODES IS 24

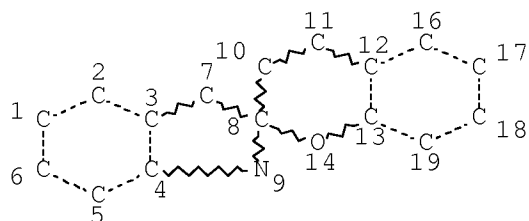
STEREO ATTRIBUTES: NONE

L24 283 SEA FILE=REGISTRY SUB=L5 SSS FUL L22

100.0% PROCESSED 1798 ITERATIONS  
SEARCH TIME: 00.00.01

283 ANSWERS

=> D L27 QUE STAT  
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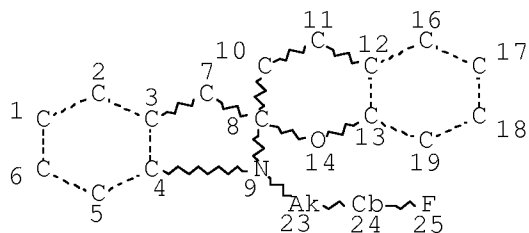


NO2 22

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DEFAULT MLEVEL IS ATOM  
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:  
RSPEC I  
NUMBER OF NODES IS 19

STEREO ATTRIBUTES: NONE  
L5 2099 SEA FILE=REGISTRY SSS FUL L3  
L25 STR



NO2 22

NODE ATTRIBUTES:  
DEFAULT MLEVEL IS ATOM  
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:  
RSPEC I  
NUMBER OF NODES IS 22

STEREO ATTRIBUTES: NONE  
L27 16 SEA FILE=REGISTRY SUB=L5 SSS FUL L25

100.0% PROCESSED            73 ITERATIONS  
SEARCH TIME: 00.00.34

16 ANSWERS

=> FILE HCA

FILE 'HCA' ENTERED AT 13:00:49 ON 23 FEB 2010  
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.  
PLEASE SEE "HELP USAGETERMS" FOR DETAILS.  
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CLAIM 21 AND RELATED

=> D L28 1-5 BIB ABS HITSTR HITRN

L28 ANSWER 1 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 151:481759 HCA Full-text

TI Spiropyran-based optimized time temperature indicator

IN Mudaliar, Chandrasekhar Dayal; Bahulekar, Neelesh Suresh; Shanbhag,  
Anil; Sahasrabudhe, Suhas Dattatraya; Feiler, Leonhard

PA BASF SE, Germany

SO PCT Int. Appl., 37pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	WO 2009127529	A1	20091022	WO 2009-EP53948	20090402
PRAI	EP 2008-154635	A	20080416		

AB A time temp. indicator comprising a spiropyran in a colored state and a modifier which is able to control the coloration and decoloration kinetics (from short periods, e.e. hours or day to quite long periods, e.g. several months) is used for monitoring of handling of perishable goods. Thus, naphthalene can be used as a retarder for a 6-nitro-substituted spiropyran (by mixing 5 g a spiropyran in a mortar at 60 - 70° with 5 g naphthalene and making an ink from this compn.) resulting in essential slowing down of decoloration at 2°.

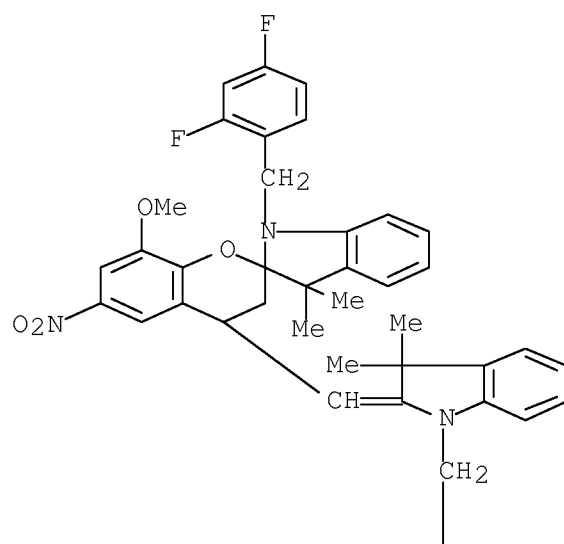
IT 1192029-73-4P

(spiropyran-based optimized time temp. indicator)

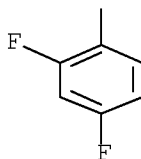
RN 1192029-73-4 HCA

CN INDEX NAME NOT YET ASSIGNED

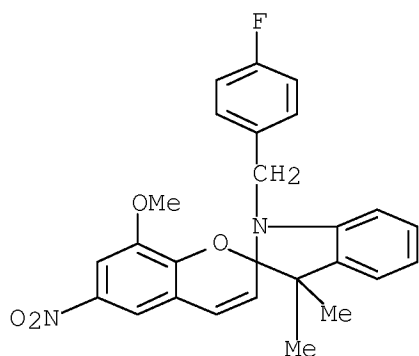
PAGE 1-A



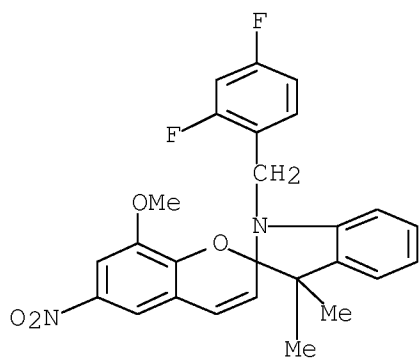
PAGE 2-A



IT 901771-78-6 1037313-40-8  
(spiropyran-based optimized time temp. indicator)  
RN 901771-78-6 HCA  
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-  
nitro- (CA INDEX NAME)



RN 1037313-40-8 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(2,4-difluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-  
 6-nitro- (CA INDEX NAME)



IT 1192029-73-4P  
 (spiropyran-based optimized time temp. indicator)  
 IT 901771-78-6 1037313-40-8  
 (spiropyran-based optimized time temp. indicator)

L28 ANSWER 2 OF 5 HCA COPYRIGHT 2010 ACS on STN  
 AN 151:307509 HCA Full-text  
 TI Disposable measuring device for UV radiation  
 IN Faran, Ori  
 PA Skyrad Ltd, Israel  
 SO PCT Int. Appl., 24pp.  
 CODEN: PIXXD2  
 DT Patent  
 LA English  
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	WO 2009104192	A2	20090827	WO 2009-IL200	20090222
PRAI	US 2008-30813P	P	20080222		

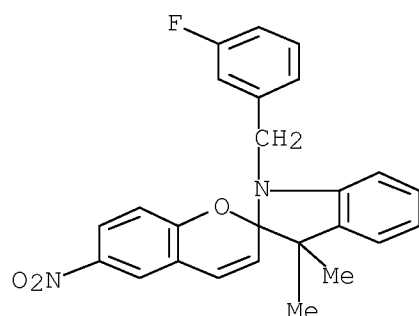
AB Disposable devices for measuring UV radiation exposure are described which comprise a matrix;  $\geq 1$  photochromic compd. assocd. with the matrix which is capable of changing its color when exposed to UV radiation; and a color changing agent distributed within the matrix which irreversibly changes the device's color as a function of the UV dose irradiated, the device not being affected by ambient conditions and visible light.

IT 1185001-29-9

(disposable UV dosimeters)

RN 1185001-29-9 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-[(3-fluorophenyl)methyl]-1',3'-dihydro-3',3'-dimethyl-6-nitro- (CA  
INDEX NAME)



IT 1185001-29-9

(disposable UV dosimeters)

L28 ANSWER 3 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 149:346289 HCA Full-text

TI Color changing indicator

IN Reichert, Hans; Nisbet, Tracey

PA Ciba Holding Inc., Switz.

SO PCT Int. Appl., 26pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	WO 2008104468	A1	20080904	WO 2008-EP51911	20080218
	EP 2115454	A1	20091111	EP 2008-716903	20080218
	KR 2009127143	A	20091209	KR 2009-720027	20080218
	IN 2009CN04932	A	20091030	IN 2009-CN4932	20090821
	CN 101646940	A	20100210	CN 2008-80006234	20090826
PRAI	EP 2007-103103	A	20070227		

WO 2008-EP51911 W 20080218

OS MARPAT 149:346289

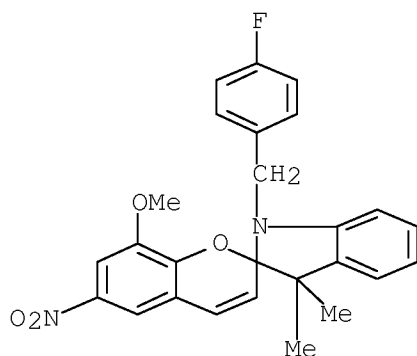
AB The present invention relates to an indicator system comprising (a) an indicator system comprising (a) a photo- or thermochromic indicator compd. and (b) a luminescent colorant which increases the color difference of the color change of the reagent by  $\geq 0.5$  units.

IT 901771-78-6

(color changing indicator system)

RN 901771-78-6 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



IT 901771-78-6

(color changing indicator system)

RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L28 ANSWER 4 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 149:174950 HCA Full-text

TI Photostabilized time temperature indicator

IN Tenetov, Elena; Salman, Husein; Assous, Julien; Feiler, Leonhard;  
Raimann, Thomas

PA Freshpoint Holdings SA, Switz.

SO PCT Int. Appl., 39pp.  
CODEN: PIXXD2

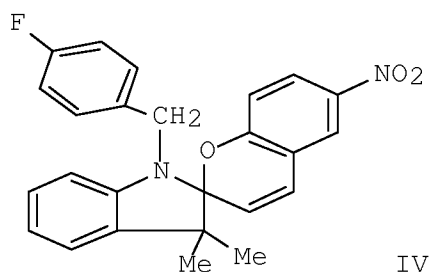
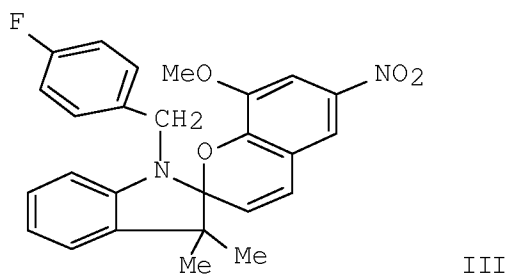
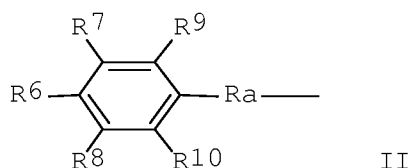
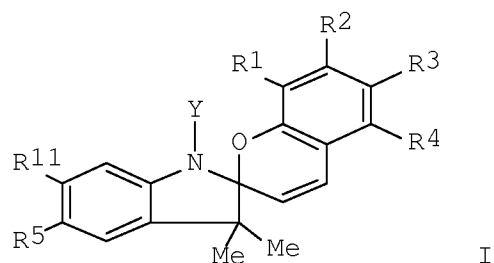
DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	WO 2008083925	A1	20080717	WO 2007-EP64594	20071228
	EP 2102307	A1	20090923	EP 2007-858190	20071228
	KR 2009122925	A	20091201	KR 2009-716771	20071228
	CN 101611115	A	20091223	CN 2007-80049555	20090709
	US 20100034961	A1	20100211	US 2009-522559	20090916

PRAI EP 2007-100411 A 20070111  
 WO 2007-EP64594 W 20071228  
 ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT  
 OS MARPAT 149:174950  
 GI



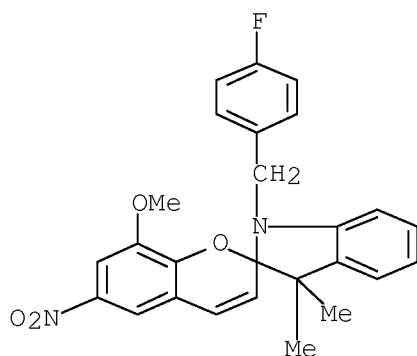
AB The present invention relates to time-temp. indicator (TTI) systems comprising spiropyran indicator I wherein R1 is H, -C1-C6 alkoxy, halogen, C1-6 alkyl or -NO2, R2 is H or C1-6 alkoxy; R3 is NO2 or halogen; R4 is H, C1-6 alkoxy or halogen; R5 is H, halogen, C1-6 alkoxy, -COOH, -COO-C1-6alkyl, -CF3 or phenyl; R11 H or R11 and R5 form together a Ph ring; Y is Ph, naphthyl, anthracene-9-yl, 9H-fluorene-9-yl or a residue II wherein R6 is H, halogen, C1-6 alkoxy, -NO2, -CF3, -O-CF3, -CN, -COO-C1-6alkyl, Ph or biphenyl, 9H-fluorene-9-yl; R7 is H, halogen, -CN, C1-6 alkoxy or R7 and R6 form together a Ph ring; R8 is H, halogen, -CN, or C1-6 alkoxy; R9 is H or halogen or CN. R10 is H or halogen or CN. Ra is -(CH2)n- with n = 1-6 or -CH2-CH=CH-. With the proviso that III and IV are excluded.

IT 901771-78-6P

(photostabilized time temp. indicator)

RN 901771-78-6 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)

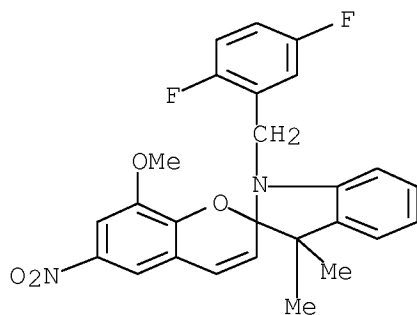


IT 1039745-03-3 1039745-04-4 1039745-05-5  
 1039745-06-6 1039745-09-9 1039745-11-3  
 1039745-12-4 1039745-17-9 1039745-18-0  
 1039745-19-1 1039745-20-4

(photostabilized time temp. indicator)

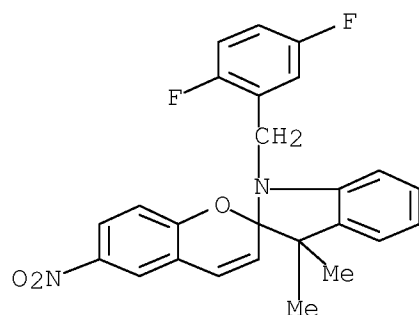
RN 1039745-03-3 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(2,5-difluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-  
 6-nitro- (CA INDEX NAME)

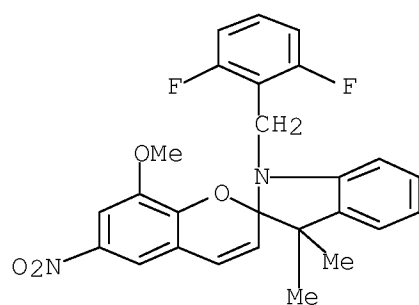


RN 1039745-04-4 HCA

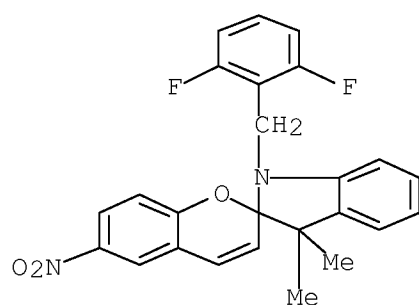
CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(2,5-difluorophenyl)methyl]-1',3'-dihydro-3',3'-dimethyl-6-nitro-  
 (CA INDEX NAME)



RN 1039745-05-5 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(2,6-difluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-  
 6-nitro- (CA INDEX NAME)

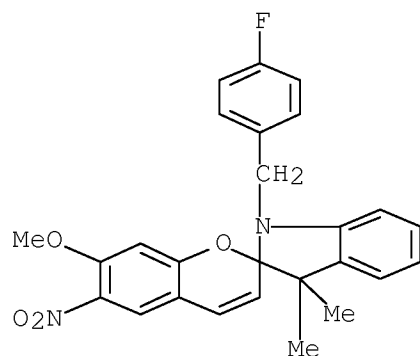


RN 1039745-06-6 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(2,6-difluorophenyl)methyl]-1',3'-dihydro-3',3'-dimethyl-6-nitro-  
 (CA INDEX NAME)

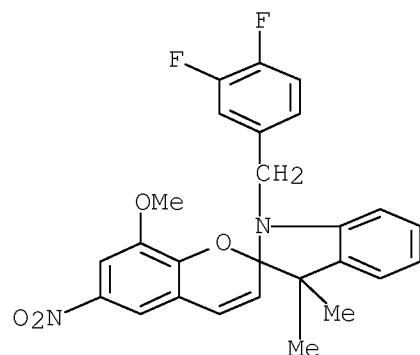


RN 1039745-09-9 HCA

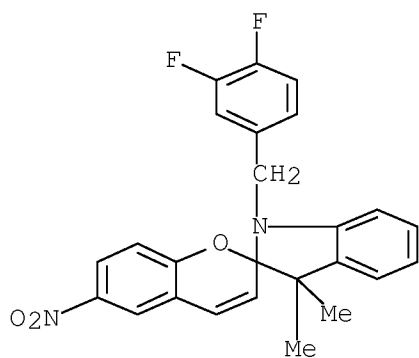
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-7-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



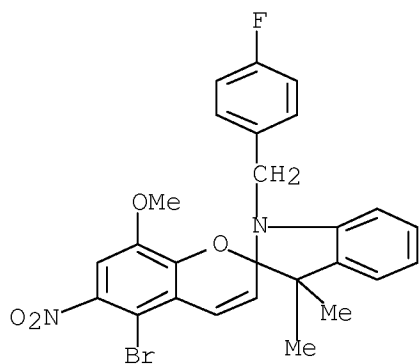
RN 1039745-11-3 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1'-[(3,4-difluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



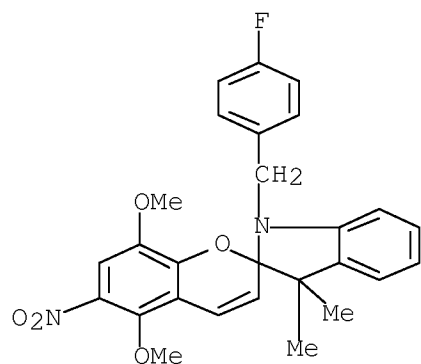
RN 1039745-12-4 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1'-[(3,4-difluorophenyl)methyl]-1',3'-dihydro-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



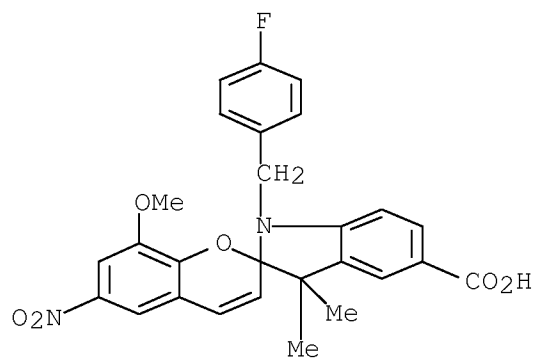
RN 1039745-17-9 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 5-bromo-1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-  
 dimethyl-6-nitro- (CA INDEX NAME)



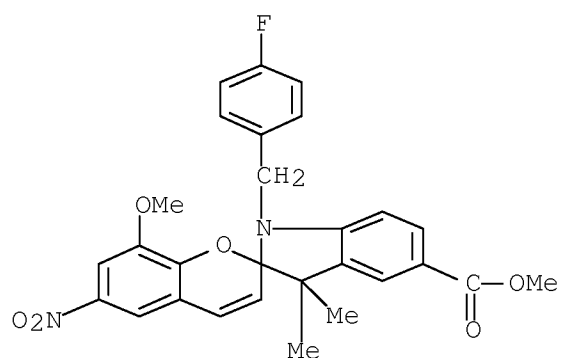
RN 1039745-18-0 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-5,8-dimethoxy-3',3'-dimethyl-  
 6-nitro- (CA INDEX NAME)



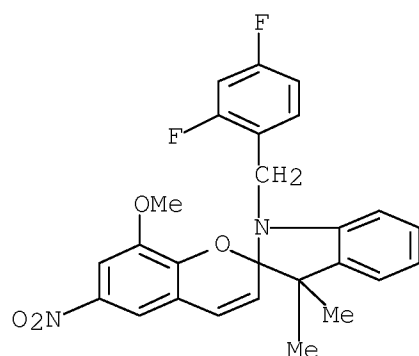
RN 1039745-19-1 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole]-5'-carboxylic acid,  
 1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-  
 nitro- (CA INDEX NAME)



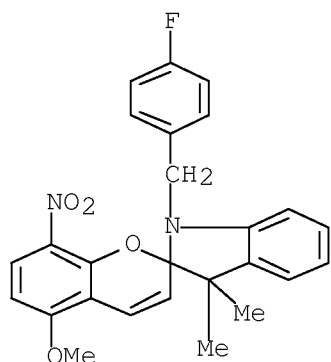
RN 1039745-20-4 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole]-5'-carboxylic acid,  
 1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-  
 nitro-, methyl ester (CA INDEX NAME)



IT 1037313-40-8P 1039745-22-6P  
 (photostabilized time temp. indicator)  
 RN 1037313-40-8 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(2,4-difluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-  
 6-nitro- (CA INDEX NAME)



RN 1039745-22-6 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-5-methoxy-3',3'-dimethyl-8-  
 nitro- (CA INDEX NAME)



IT 901771-78-6P  
(photostabilized time temp. indicator)

IT 1039745-03-3 1039745-04-4 1039745-05-5  
1039745-06-6 1039745-09-9 1039745-11-3  
1039745-12-4 1039745-17-9 1039745-18-0  
1039745-19-1 1039745-20-4

(photostabilized time temp. indicator)

IT 1037313-40-8P 1039745-22-6P

(photostabilized time temp. indicator)

RE.CNT 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L28 ANSWER 5 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 149:163817 HCA Full-text

TI Time temperature indicator with balanced photochemical processes

IN Fuchs, Andre; Carrigan, Anne Veronica

PA Ciba Holding Inc., Switz.

SO PCT Int. Appl., 20pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	WO 2008083895	A1	20080717	WO 2007-EP64019	20071217
	KR 2009098840	A	20090917	KR 2009-713103	20071217
	EP 2102306	A1	20090923	EP 2007-857653	20071217
	CN 101652448	A	20100217	CN 2007-80047906	20090623
PRAI	EP 2007-100389	A	20070111		
	WO 2007-EP64019	W	20071217		

AB The invention relates to a time temp. indicator comprising at least one photochromic colorant introduced into and/or atop a matrix substrate and charged by exposure to UV light, at least a transparent colorless or a transparent colored light absorbing protecting layer adhered to the underlying layer which contains the photo-chromic colorant, characterized in that the light absorbing protecting layer comprises 1 - 50% of an UV light

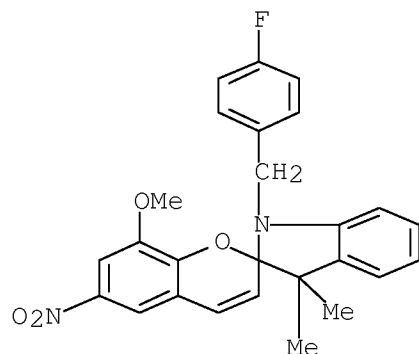
absorber or an UV light absorber mixt. and 0.1 - 10% of an optical brightener wherein the wt. ratio of the UV light absorber and optical brightener is 0.1 - 10.

IT 901771-78-6 1037313-40-8

(time temp. indicator with balanced photochem. processes)

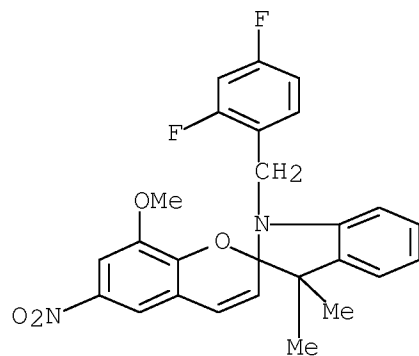
RN 901771-78-6 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-[(4-fluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



RN 1037313-40-8 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-[(2,4-difluorophenyl)methyl]-1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



IT 901771-78-6 1037313-40-8

(time temp. indicator with balanced photochem. processes)

RE.CNT 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

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CLAIM 7 AND RELATED

=> D L42 1-8 BIB ABS HITSTR HITIND

L42 ANSWER 1 OF 8 HCA COPYRIGHT 2010 ACS on STN

AN 143:231562 HCA Full-text

TI ~~Time-temperature~~ indicator based on  
~~valence isomerizations~~

IN Levy, Yoav; Haarer, Dietrich

PA Freshpoint Holdings S. A., Switz.

SO PCT Int. Appl., 58 pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	WO 2005075978	A2	20050818	WO 2005-EP50291	20050124
	WO 2005075978	A3	20051006		
	AU 2005210754	A1	20050818	AU 2005-210754	20050124
	EP 1711809	A2	20061018	EP 2005-701597	20050124
	CN 1914509	A	20070214	CN 2005-80003805	20050124
	JP 2007531873	T	20071108	JP 2006-551838	20050124
	US 20070172951	A1	20070726	US 2006-587586	20060728
	IN 2006CN02822	A	20070608	IN 2006-CN2822	20060801
	MX 2006008688	A	20070216	MX 2006-8688	20060802
	KR 2006124740	A	20061205	KR 2006-717818	20060901
PRAI	US 2004-540558P	P	20040202		
	US 2004-564232P	P	20040422		
	WO 2005-EP50291	W	20050124		

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

OS MARPAT 143:231562

AB The present invention relates to a ~~time temp.~~ indicator comprising at least one indicator compd. in a first isomeric form, which is converted into a second isomeric form of the indicator compd. (e.g., a diarylethene or a spriroarom. compd.) in a ~~valence isomerization~~ reaction without migration of an atom or chem. group attached to said indicator compd. in a ~~time and temp.~~ dependent manner, wherein the formation of the second isomeric form is detectable by monitoring a phys. characteristic of the indicator. The present invention also relates to a method of manufg. such a ~~time-temp.~~ indicator comprising the steps of (a) embedding in or atop a matrix said indicator compd.; and (b) inducing the formation of a metastable state of said embedded indicator compd.

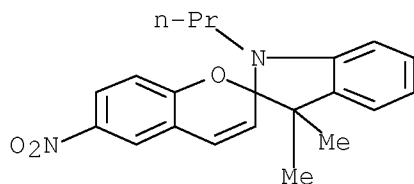
IT ~~28999-46-4P~~

(~~time-temp.~~ indicator based on ~~valence~~  
~~isomerizations~~)

RN 28999-46-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],

1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)

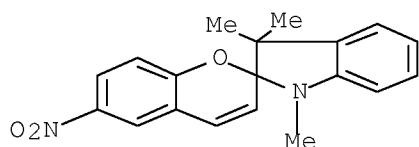


IC ICM G01N031-22  
ICS C08K005-34; C07D491-10; C07D333-56  
CC 42-12 (Coatings, Inks, and Related Products)  
Section cross-reference(s): 41  
ST time temp indicator diarylethene spiroarom compd  
IT Inks  
(printing; time-temp. indicator based on  
valence isomerizations)  
IT Dyes  
(time-temp. indicator; time-  
temp. indicator based on valence  
isomerizations)  
IT 28999-46-4P  
(time-temp. indicator based on valence  
isomerizations)  
IT 97-51-8, 2-Hydroxy-5-nitrobenzaldehyde 143218-77-3  
(time-temp. indicator based on valence  
isomerizations)  
IT 112440-47-8 115755-82-3 126935-36-2,  
2-(1,2-Dimethyl-3-indolyl)-3-(2,4,5-trimethyl-3-thienyl) maleic  
anhydride 139911-02-7 151539-92-3 172612-67-8,  
1,2-Bis(2,4-dimethyl-5-phenylthiophene-3-yl)perfluorocyclopentene  
862592-10-7 862592-11-8  
(time-temp. indicator based on valence  
isomerizations)  
OSC.G 6 THERE ARE 6 CAPLUS RECORDS THAT CITE THIS RECORD (6 CITINGS)  
RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT  
  
L42 ANSWER 2 OF 8 HCA COPYRIGHT 2010 ACS on STN  
AN 140:414847 HCA Full-text  
TI Characterization of photochromic bit-wise volumetric storage media for  
space applications  
AU Zhang, Yan; Butz, John; Curtis, Jason B.; Beaudry, Neil A.; Bletscher,  
Warren L.; Erwin, James K.; Knight, Dak; Milster, Thomas D.; Walker,  
Edwin P.  
CS Optical Sciences Ctr., University of Arizona, Tucson, AZ, 85721, USA  
SO Proceedings of SPIE-The International Society for Optical Engineering  
(2003), 5069(Optical Data Storage 2003), 286-293  
CODEN: PSISDG; ISSN: 0277-786X

PB SPIE-The International Society for Optical Engineering  
 DT Journal  
 LA English  
 AB The authors report playback performance results of volumetric optical data storage disks that are made from a new class of light-absorbing (photochromic) compds. The disks are first exposed to a simulated space environment. In order to simulate the space environment, a vacuum oven bakes the disks for certain amt. of ~~time~~ at a designated ~~temp.~~ Test results in this temp. study are fit into an Arrhenius model. Disks are also exposed to radiation doses similar to those found in a space environment. Disks fail in high temp. and large proton-dose conditions. Heavy ions do not cause significant disks failure. The prevention of disk failure due to harsh space environments is also discussed.

IT ~~1498-88-0~~  
 (non-written form; characterization of photochromic bit-wise volumetric storage media for space applications)

RN 1498-88-0 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



CC 74-12 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)  
 Section cross-reference(s): 73

IT ~~1498-88-0~~  
 (non-written form; characterization of photochromic bit-wise volumetric storage media for space applications)

OSC.G 4 THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD (4 CITINGS)  
 RE.CNT 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD  
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L42 ANSWER 3 OF 8 HCA COPYRIGHT 2010 ACS on STN  
 AN 133:336541 HCA Full-text  
 TI Thermal reversion mechanism of N-functionalized merocyanines to spiropyran: a solvatochromic, solvatokinetic, and semiempirical study  
 AU Wojtyk, James T. C.; Wasey, Adnaan; Kazmaier, Peter M.; Hoz, Shmaryahu; Buncel, Erwin  
 CS Department of Chemistry, Queen's University, Kingston, ON, K7L 3N6, Can.  
 SO Journal of Physical Chemistry A (2000), 104(39), 9046-9055  
 CODEN: JPCAFH; ISSN: 1089-5639  
 PB American Chemical Society  
 DT Journal  
 LA English

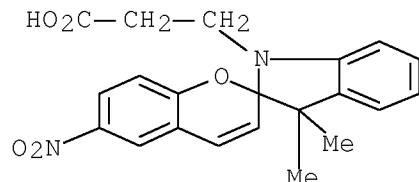
AB In continuing studies of the effect of solvent and mol. structure on the behavior of photochromic and ~~thermo~~chromic dye mols., esp. spiropyran (SP)-merocyanine (MC) interconversions, we have examd. a series of 6'-nitrobenzoindolinospiropyrans (6-nitro-BIPS) with varying N-R functionalities (R = Me, CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H, CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>SO<sub>3</sub><sup>-</sup>, CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>-cholesteryl). The solvent effect was assessed by following the thermal decay of the photochem. ring-opened merocyanine to the spiropyran (MC  $\rightleftharpoons$  SP) via UV/visible spectroscopy at the  $\lambda_{\text{max}}$  of the MC form. It was found that while modification of the N-moiety produced no perturbations in the solvatochromic behavior of these dyes, there was a marked effect on the solvatokinetic behavior. In nonpolar solvents, where the MCs possess predominantly quinoid character (unit central bond order), a const. thermal reversion rate was obsd. for the MCs with electron-rich N-ligands. This was attributed to electronic and steric interactions between the ligands and the phenoxide moiety. However, in polar solvents the increased zwitterionic character of the MCs (central bond order  $\approx$  2) leads to inhibition of the thermal reversion rate for the MCs in this study, independent of N-functionality. The MC  $\rightleftharpoons$  SP interconversion has also been examd. by means of semiempirical calcns. These reveal the lowest energy pathway for conversion of the trans-MC to a cis-MC form via sequential bond rotation of the three central dihedral angles ( $\alpha$ ,  $\beta$ , and  $\gamma$ ). The calcns. support the obsd. solvatokinetic behavior, leading to the assignment of the trans/cis ~~thermal isomerization~~ as the rate-detg. step in the overall process.

IT 55779-26-5

(dye; thermal reversion mechanism of merocyanines to spiropyrans)

RN 55779-26-5 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-propanoic acid, 3',3'-dimethyl-6-nitro- (CA INDEX NAME)

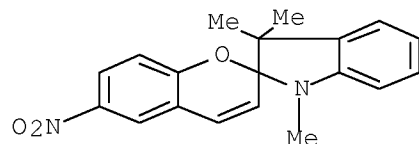


IT 1498-88-0 137588-90-0 303981-48-8

(dye; thermal reversion mechanism of merocyanines to spiropyrans)

RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole], 1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)

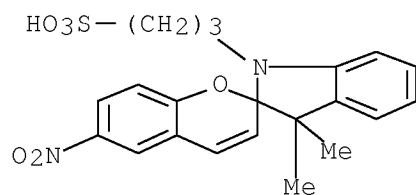


RN 137588-90-0 HCA  
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-propanesulfonic acid,  
3',3'-dimethyl-6-nitro-, compd. with N,N-diethylethanamine (1:1) (CA  
INDEX NAME)

CM 1

CRN 137588-89-7

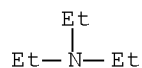
CMF C21 H22 N2 O6 S



CM 2

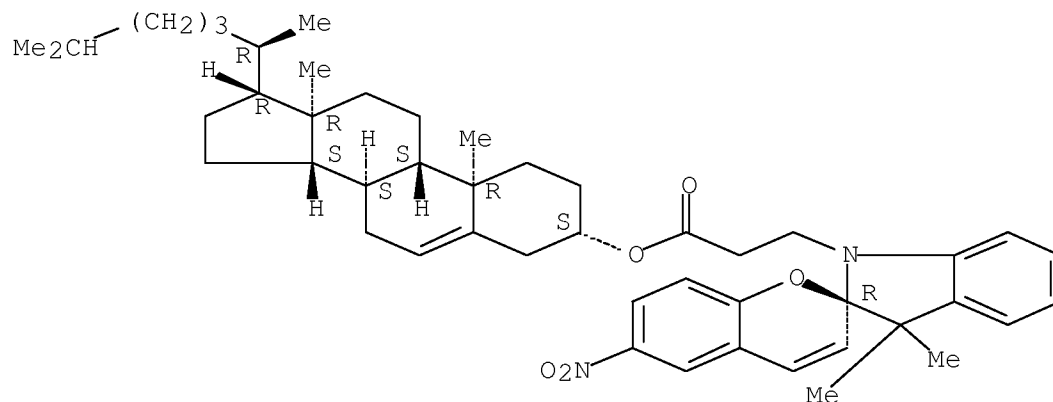
CRN 121-44-8

CMF C6 H15 N



RN 303981-48-8 HCA  
CN Cholest-5-en-3-ol (3 $\beta$ )-, (2R)-3',3'-dimethyl-6-nitrospiro[2H-1-  
benzopyran-2,2'-[2H]indole]-1'(3'H)-propanoate (9CI) (CA INDEX NAME)

Absolute stereochemistry.



CC 41-11 (Dyes, Organic Pigments, Fluorescent Brighteners, and Photographic Sensitizers)

Section cross-reference(s): 73

IT Isomerization

(cis-trans, thermal; in thermal reversion mechanism of merocyanines to spiropyrans)

IT 55779-26-5

(dye; thermal reversion mechanism of merocyanines to spiropyrans)

IT 1498-88-0 18457-95-9 137588-90-0

303981-48-8 303981-49-9 303981-51-3 303981-52-4

(dye; thermal reversion mechanism of merocyanines to spiropyrans)

OSC.G 39 THERE ARE 39 CAPLUS RECORDS THAT CITE THIS RECORD (39 CITINGS)

RE.CNT 48 THERE ARE 48 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L42 ANSWER 4 OF 8 HCA COPYRIGHT 2010 ACS on STN

AN 126:230642 HCA Full-text

OREF 126:44507a,44510a

TI Photochemically-, chemically- and pH-controlled electrochemistry at functionalized spiropyran monolayer electrodes

AU Doron, Amihod; Katz, Eugenii; Tao, Guoliang; Willner, Itamar

CS Department of Organic Chemistry, Hebrew University of Jerusalem, Jerusalem, 91904, Israel

SO Langmuir (1997), 13(6), 1783-1790

CODEN: LANGD5; ISSN: 0743-7463

PB American Chemical Society

DT Journal

LA English

AB A photoisomerizable nitrospiropyran monolayer assembled on a Au electrode provides a functionalized interface for the photochem., pH, and thermal control of electrochem. processes of charged electroactive redox probes. (Mercaptobutyl)nitrospiropyran 1 was assembled as a monolayer on a Au electrode. The monolayer exhibits reversible photoisomerizable features, and illumination of the nitrospiropyran monolayer, SP state,  $320 \text{ nm} < \lambda <$

350 nm, yields at pH = 7.0 the protonated nitromerocyanine monolayer state, MRH<sup>+</sup> state. Further irradiation of the MRH<sup>+</sup> monolayer,  $\lambda > 495$  nm, regenerates the SP state of the monolayer. The light-induced transformation of the monolayer between a neutral and a pos.-charged interface allows the control of the electron transfer processes at the electrode interface. Electrooxidation of the neg.-charged (3,4-dihydroxyphenyl)acetic acid, DHPAA, is enhanced at the MRH<sup>+</sup> monolayer electrode as compared to the SP-functionalized monolayer electrode. Electrooxidation of the pos.-charged 3-hydroxytyramine (dopamine), DOPA, is inhibited at the MRH<sup>+</sup> monolayer electrode as compared to its oxidation by the SP monolayer electrode. The control of the electrochem. oxidation of DHPAA and DOPA at the photoisomerizable monolayer electrode is attributed to the electrostatic interactions of the MRH<sup>+</sup> monolayer electrode with the redox-active substrates. Electrostatic attraction of DHPAA and repulsion of DOPA by the MRH<sup>+</sup> monolayer results in enhancement or inhibition of the electrochem. processes, resp. By reversible isomerization of the monolayer between the SP and MRH<sup>+</sup> states, cyclic amperometric transduction of the optical signals recorded by the monolayer is accomplished. In the presence of a mixture of oppositely-charged redox substrates, i.e. DHPAA and 2,5-bis[[2-(dimethylbutylammonio)ethyl]amino]-1,4-benzoquinone (3) or pyrroloquinoline quinone, PQQ, (4) and 3, photostimulated selective electrochem. is accomplished in the presence of the photoisomerizable monolayer electrode. The transformation of the protonated nitromerocyanine monolayer, MRH<sup>+</sup> state, generated at pH = 7.0, to the zwitterionic nitromerocyanine configuration, MR<sup>±</sup> state at higher pH, allows the pH-controlled electrooxidation of DHPAA and DOPA at the monolayer electrode. Similarly, thermal isomerization of the SP monolayer electrode, pH = 7.0, 60°, yields the MRH<sup>+</sup> monolayer electrode. These thermochromic features of the monolayer are employed to resp. activate or deactivate the electrooxidation of DHPAA or DOPA at the functionalized electrode. By cyclic thermal isomerization of the SP monolayer to the MRH<sup>+</sup> monolayer followed by photochem. isomerization of the MRH<sup>+</sup> monolayer to the SP state,  $\lambda > 495$  nm, the thermochromic and photochromic features of the monolayer are amperometrically transduced via the oxidation of DHPAA and DOPA, resp. Electrochem. oxidation of DHPAA and DOPA is further accomplished by the application of a dinitrospiropyran monolayer (2) electrode in the presence of the dinitrophenyl antibody, DNP-Ab. (Mercaptobutyl)dinitrospiropyran 2 was assembled as a monolayer on a Au electrode. The dinitrospiropyran monolayer, SP state, exhibits antigen features for the DNP-Ab, where the protonated dinitromerocyanine monolayer, MRH<sup>+</sup> state, lacks antigen features for the DNP-Ab. Association of the DNP-Ab to the SP monolayer electrode blocks the electrooxidation of DHPAA or DOPA. Photochem. isomerization of the SP monolayer to the MRH<sup>+</sup> state, 320 nm <  $\lambda$  < 350 nm, results in the release of DNP-Ab and the activation of the electrooxidation of DHPAA and DOPA. By the reversible photoisomerization of the monolayer between the SP and MRH<sup>+</sup> states in the presence of DNP-Ab, cyclic amperometric transduction of the optical signals recorded by the monolayer is accomplished.

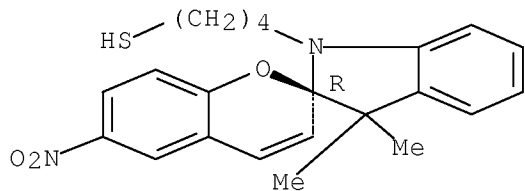
IT 174153-55-0 188358-94-3

(photochem.-, chem.- and pH-controlled electrochem. at functionalized spiropyran monolayer gold electrodes)

RN 174153-55-0 HCA

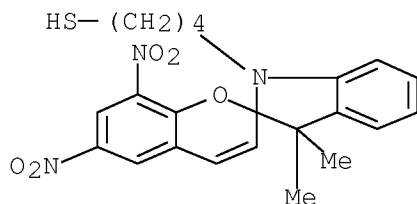
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-butanethiol,  
3',3'-dimethyl-6-nitro-, (R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.



RN 188358-94-3 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-butanethiol,  
3',3'-dimethyl-6,8-dinitro- (CA INDEX NAME)



CC 72-2 (Electrochemistry)

Section cross-reference(s): 22, 66, 69, 74

IT 174153-55-0 188358-94-3

(photochem.-, chem.- and pH-controlled electrochem. at  
functionalized spiropyran monolayer gold electrodes)

OSC.G 75 THERE ARE 75 CAPLUS RECORDS THAT CITE THIS RECORD (78  
CITINGS)

RE.CNT 42 THERE ARE 42 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L42 ANSWER 5 OF 8 HCA COPYRIGHT 2010 ACS on STN

AN 112:180320 HCA Full-text

OREF 112:30519a,30522a

TI Phototransformation of merocyanine forms of spiropyran in amorphous  
polymeric media

AU Uznanski, P.; Wojda, A.; Kryszewski, M.

CS Cent. Mol. Macromol. Stud., Polish Acad. Sci., Lodz, 90-363, Pol.

SO European Polymer Journal (1990), 26(2), 141-3

CODEN: EUPJAG; ISSN: 0014-3057

DT Journal

LA English

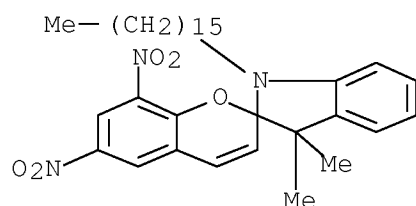
AB The influence of annealing ~~time~~ below glass ~~temp.~~ on the kinetic behavior of photochromic spiropyran (Sp) mols., with long aliph. substituents, embedded in polystyrene solid soln. is discussed. The data indicate an increase of merocyanine form (Mc) → Sp phototransformation rate as a function of aging, in contrast to the results of the influence of free vol. distribution in the polymers obtained by using azobenzene chromophore. A linear dichroism spectrum produced by photoselection and phototransformation kinetics measured at different parts of the Mc absorption band reveal that the obsd. divergences may result from different kinetic consts. of individual stereoisomers and from the presence of long chain substituents in the probe under study.

IT 62518-40-5

(phototransformation kinetics of, merocyanine-to-spiropyran forms, in amorphous polystyrene, annealing effect on)

RN 62518-40-5 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-hexadecyl-1',3'-dihydro-3',3'-dimethyl-6,8-dinitro- (CA INDEX NAME)



CC 36-5 (Physical Properties of Synthetic High Polymers)

IT 62518-40-5

(phototransformation kinetics of, merocyanine-to-spiropyran forms, in amorphous polystyrene, annealing effect on)

OSC.G 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)

L42 ANSWER 6 OF 8 HCA COPYRIGHT 2010 ACS on STN

AN 112:35095 HCA [Full-text](#)

OREF 112:6061a,6064a

TI **Thermal isomerization** behaviors of a spiropyran in bilayers immobilized with a linear polymer and a smectitic clay

AU Seki, Takahiro; Ichimura, Kunihiro

CS Res. Inst. Polym. Text., Tsukuba, 305, Japan

SO Macromolecules (1990), 23(1), 31-5

CODEN: MAMOBX; ISSN: 0024-9297

DT Journal

LA English

AB **Thermal isomerization** kinetics of photoinduced merocyanine to spiropyran is investigated in solid films having multibilayer structures, which consists of ion complexes between an ammonium bilayer forming amphiphile and polyanions. The reaction rates in these films abruptly increase near the crystal to liq.-crystal phase-transition temp. of the immobilized bilayer

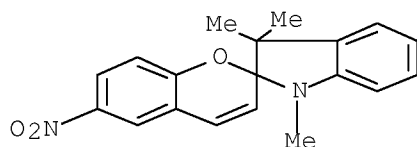
due to increased matrix mobility. The bilayer film immobilized with a smectic silicate instead of a linear polymer provides more homogeneous reaction environments for the isomerizing chromophore and gives rise to a larger rate change at the phase-transition temp. These improved properties by use of the clay is correlated to the increased order of bilayer structures in the film.

IT 1498-88-0

(photochromism of, in bilayers immobilized with linear polymers or smectic clay, phase transition control of kinetics of)

RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



CC 22-6 (Physical Organic Chemistry)  
Section cross-reference(s): 41, 75

ST **thermal isomerization** spiropyran bilayer kinetics;  
merocyanine isomerization kinetics immobilized bilayer; polymer linear  
immobilized bilayer; smectic clay immobilized bilayer

IT **Thermochromism**

(of merocyanine in bilayers immobilized in linear polymer or  
smectic clay, phase transition dependence of kinetics of)

IT Membranes

(bilayer, ammonium type, **thermal isomerization**  
of photoinduced merocyanine to spiropyran in medium of, kinetics  
of)

IT 1498-88-0

(photochromism of, in bilayers immobilized with linear polymers or  
smectic clay, phase transition control of kinetics of)

OSC.G 45 THERE ARE 45 CAPLUS RECORDS THAT CITE THIS RECORD (45  
CITINGS)

L42 ANSWER 7 OF 8 HCA COPYRIGHT 2010 ACS on STN

AN 110:7353 HCA Full-text

OREF 110:1355a,1358a

TI Photo- and **thermochromic** spirans. 17. Theoretical prediction  
of barriers in **thermal valence**  
**isomerization** reactions for spiropyrans

AU Makarov, S. P.; Simkin, B. Ya.; Minkin, V. I.

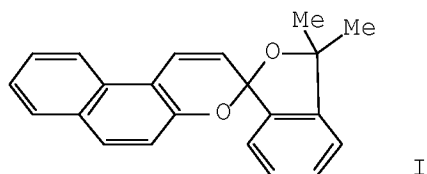
CS Rostov. Gos. Univ., Rostov, 344090, USSR

SO Khimiya Geterotsiklicheskikh Soedinenii (1988), (2), 172-7  
CODEN: KGSSAQ; ISSN: 0453-8234

DT Journal

LA Russian

GI

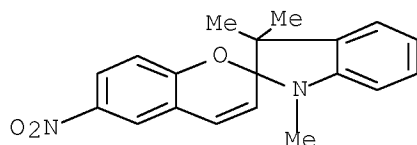


AB The MINDO/3 method was used to study the **valence isomerization** of 2H-pyrans and chromene. A correlation was found between the exptl. activation barrier for **valence isomerization** of spirans, e.g., I, and the difference in  $\pi$ -bond energy between the **valence isomers**.

IT 1498-88-0 5150-50-5  
(ring cleavage of, energetics of)

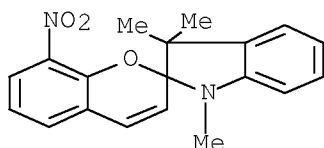
RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



RN 5150-50-5 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-8-nitro- (CA INDEX NAME)



CC 22-6 (Physical Organic Chemistry)  
ST **valence isomerization** spiropyran MINDO3;  
**thermochromism** spiropyran energetic  
IT Ring cleavage  
**Thermochromism**  
(of spiropyrans, energetics of)

IT Isomerization  
 (valence, of pyrans and chromene, MINDO/3 study of)

IT 178-30-3, 2,2'-Spirobi[2H-1-benzopyran] 229-80-1,  
 3H-Naphtho[2,1-b]pyran 253-34-9, 3H-2-Benzopyran 253-35-0,  
 1H-2-Benzopyran ~~1498-88-0~~ 1592-43-4 ~~5150-50-5~~  
 13433-31-3 18871-60-8 74069-76-4,  
 Spiro[2H-1-benzopyran-2,2'-[2H]pyran] 74069-87-7 86764-93-4  
 86764-94-5 86764-95-6 101829-91-8 117930-00-4 117930-01-5  
 117930-02-6 117930-03-7 117930-04-8,  
 6-Oxaspiro[4.5]deca-1,3,7,9-tetraene 117930-05-9 117930-06-0  
 117930-07-1  
 (ring cleavage of, energetics of)

IT 254-04-6, 2H-1-Benzopyran 289-66-7, 2H-Pyran 83372-63-8,  
 2H-Pyran-2-amine 91735-81-8, 5-Hydroxy-2H-pyran 91735-82-9,  
 5-Amino-2H-pyran 91735-83-0, 5-Nitro-2H-pyran 91735-84-1,  
 2H-Pyran-5-carboxaldehyde 91735-85-2, 2H-Pyran-2-ol 91735-86-3,  
 2H-Pyran-2,2-diol 91735-87-4 117929-98-3,  
 2H-Pyran-2-carboxaldehyde 117929-99-4, 6-Amino-2H-pyran  
 (valence isomerization of, MINDO/3 study of)

OSC.G 4 THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD (5 CITINGS)

L42 ANSWER 8 OF 8 HCA COPYRIGHT 2010 ACS on STN

AN 49:84272 HCA Full-text

OREF 49:15901a-h

TI Spectrophotometric study of the isomerization of various  
 thermochromic spirans

AU Bloch-Chaude, Odile

SO Cahiers de Physique (1954), No. 50;No. 51;No. 52,  
 17-53;6-42;3-48  
 CODEN: CAPHAI; ISSN: 0366-5291

DT Journal

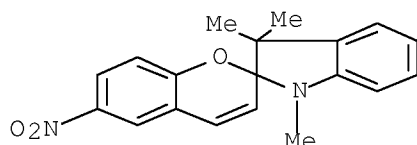
LA Unavailable

GI For diagram(s), see printed CA Issue.

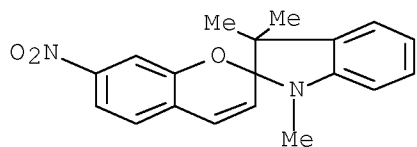
AB The changes in the extinction coeff. accompanying the establishment of  
 equil. between the colored (open) and colorless (closed) forms (e.g. W and X  
 resp.) of numerous thermochromic heterocyclic spirans were measured  
 spectrophotometrically, and the rate consts. of "opening" and "closing" were  
 calcd. The unsym. 2,2'-spirans which were studied had the following  
 component parts: 1,3,3-trimethyl-2,3-dihydroindole (F), 3-  
 methylbenzothiazoline (B), 1-methyl-1,2-dihydroquinoline (Q); 1-methyl-1,2-  
 dihydropyridine (P), 1,2H-benzopyran (I) [and its 6-O2N (II), 7-O2N (III),  
 6-Br (IV), 6-MeO (V), and 7-MeO (VI) derivs.], and 3H-naphtho[2,1-b]pyran  
 (VII). (As an example of the reference system used in this abstr. W is  
 designated FI; note that the N heterocycle bears the primed numbers. Addn.  
 of acid produced a reversible color change involving the appearance of a new  
 band (attributed to species such as Y); addn. of excess strong alkali  
 produced more intense coloration or decoloration (Q derivs.). The  
 decoloration (attributed to the formation of species such as Z) was  
 irreversible for most of the compds. studied. The effects of steric  
 hindrance on the equil. between the open and closed forms and on spectra  
 were evaluated from a study of VIII, and its 3-Me (IX), 3-iso-Pr (X), 3-Ph  
 (XI), 3,3'-di-Me (XII), 3,3'-ethylene (XIII), and 3,3'-trimethylene (XIV)

derivs. The following 2,2'-spirans were prep'd. (compd., m.p., and m.p. of its perchlorate given): FI, 93°, 269°; FII, 183°, 247°; FIII, 100°, 299°; FIV, 87°, 288°; FV, 85°, 257°; FVI, 85°, 292°; FVII, 183°, 205°; BI, -, 270°; BII, -, 277°; BIV, -, 321°; BVI, -, 250°; BVII, -, 265°; QI, -, 237°; QII, -, 285°; QIV, -, 302°; QV, -, 225°; QVI, -, 243°; QVII, -, 277°; PI, -, 240°; PII, -, 255°; PIV, -, 271°; PVI, -, 255°; PVII, -, 253°; the 3-iso-Pr deriv. of QIV, -, 280°; 3-iso-Pr deriv. of QVII, -, 258°; VIII, 270°, -; IX, 218-19°, -; X, 216°, -; XI, 253°, -; XIII, 241°, -; XIV, 243°, -. The unsym. F, B, Q, and P spirans were prep'd. by the method of Weizinger and Wenning (C.A. 34, 5082.5). VIII, IX, X, XI, XIII, and XIV were prep'd. by condensation of 2 moles of 2,1-HOC10H6CHO and 1 mole Me2CO, MeCOEt, iso-BuCOMe, MeCOCH2Ph, cyclopentanone, and cyclohexanone, resp. 53 references.

IT 1498-88-0P, Spiro[2H-1-benzopyran-2,2'-indoline],  
 1',3',3'-trimethyl-6-nitro- 20200-74-2P,  
 Spiro[2H-1-benzopyran-2,2'-indoline], 1',3',3'-trimethyl-7-nitro-  
 38582-27-3P, Spiro[2H-1-benzopyran-2,2'-indoline],  
 1',3',3'-trimethyl-6-nitro-, perchlorate 860712-68-1P,  
 Spiro[2H-1-benzopyran-2,2'-indoline], 1',3',3'-trimethyl-7-nitro-,  
 perchlorate  
 (prepn. of)  
 RN 1498-88-0 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



RN 20200-74-2 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-1',3',3'-trimethyl-7-nitro- (CA INDEX NAME)

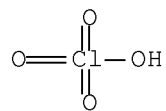


RN 38582-27-3 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-1',3',3'-trimethyl-6-nitro-, perchlorate (1:1) (CA  
 INDEX NAME)

CM 1

CRN 7601-90-3

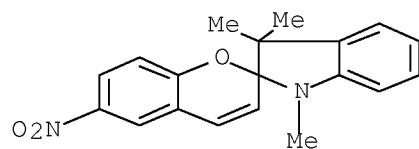
CMF Cl H O4



CM 2

CRN 1498-88-0

CMF C19 H18 N2 O3



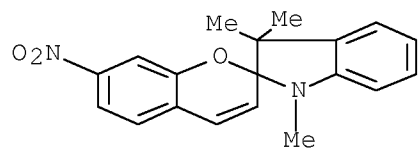
RN 860712-68-1 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
1',3'-dihydro-1',3',3'-trimethyl-7-nitro-, perchlorate (1:1) (CA  
INDEX NAME)

CM 1

CRN 20200-74-2

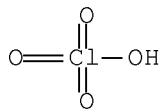
CMF C19 H18 N2 O3



CM 2

CRN 7601-90-3

CMF C1 H O4



CC 10 (Organic Chemistry)  
IT Ring  
(cleavage of, of **thermochromic** spirans, spectrophotometry of)  
IT Steric hindrance  
(in **thermochromic** spirans)  
IT Spiro compounds  
(**isomerization** of **thermochromic**, spectrophotometry of)  
IT Reaction kinetics and(or) velocity  
(of ring closing and opening of **thermochromic** spirans)  
IT Spectra  
(of **thermochromic** spiran **isomerization**)  
IT 166-01-8P, 3,3'-Spirobi[3H-naphtho[2,1-b]pyran], 2,2'-ethylene-  
178-10-9P, 3,3'-Spirobi[3H-naphtho[2,1-b]pyran] 1498-88-0P,  
(prepn. of)

=> D L43 1-39 TI

L43 ANSWER 1 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Synthesis and photochemical properties of a cationic surfactant having a spiropyran group

L43 ANSWER 2 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Theoretical study of spiropyran-merocyanine **thermal isomerization**

L43 ANSWER 3 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Evaluation of photoinduced changes in stability constants for metal-ion complexes of crowned spirobenzopyran derivatives by electrospray ionization mass spectrometry

L43 ANSWER 4 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photo-orientation movement of photoisomerizable chromophores: quantifying analytical theory and application to spectrally overlapping and distinguishable isomers

L43 ANSWER 5 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Preparation and properties of photofunctional systems with nitroxide radicals

L43 ANSWER 6 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromism of nitrospiropyrans: effects of structure, solvent and temperature

L43 ANSWER 7 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Spiropyran as a regulator of DNA hybridization with reversed switching mode to that of azobenzene

L43 ANSWER 8 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Synthesis and photochromism of spirobenzopyran derivatives bearing an oxymethylcrown ether moiety: metal ion-induced switching between positive and negative photochromisms

L43 ANSWER 9 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photoinduced dichroism as a tool for understanding orientational mobility of photoisomerizable dyes in amorphous matrixes

L43 ANSWER 10 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic molecular heat exchange medium

L43 ANSWER 11 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Chiral 2H-pyrans. 10. 1',3',3'-trimethyl-6-nitrospiro[2H-1-benzopyran-2,2'-indoline]: its thermal enantiomerization and the equilibration with its merocyanine

L43 ANSWER 12 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Determination of critical aggregation concentrations of self-assembling lipids in nonpolar organic media using spiropyrans as photochromic probes

L43 ANSWER 13 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Complexes of spiropyran-derived merocyanines with metal ions thermally activated and light-induced processes

L43 ANSWER 14 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photocontrolled gating by polymer brushes grafted on porous glass filter

L43 ANSWER 15 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Singlet versus triplet photoprocesses in indodicarbocyanine dyes and spiropyran-derived merocyanines

L43 ANSWER 16 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photoprocesses in Spiropyran-Derived Merocyanines

L43 ANSWER 17 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Highly calcium-ion-accelerated coloration of bis(spirobenzopyran) bridged by diaza-18-crown-6 moiety at the 8-position

L43 ANSWER 18 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI **Thermal isomerization** process in benzene gels of

L-glutamic acid-derived lipids with spiropyran head groups

- L43 ANSWER 19 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photoprocesses in spiropyran-derived merocyanines: singlet versus triplet pathway
- L43 ANSWER 20 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI MNDO-PM3 MO studies on the **thermal isomerization** of photochromic 1',3',3'-trimethyl-6-nitrospiro[2H-1-benzopyran-2,2'-indoline]
- L43 ANSWER 21 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Kinetic Analysis of Photochromic Systems under Continuous Irradiation. Application to Spiropyrans
- L43 ANSWER 22 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Thermal and photochemical control of an electrochemical process at an isomerizable spiropyran monolayer-modified Au electrode
- L43 ANSWER 23 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Location of melittin fragment carrying spiropyran in phospholipid bilayer membrane determined by **thermal isomerization**
- L43 ANSWER 24 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Syntheses, cation complexation, isomerization, and photochemical cation-binding control of spirobenzopyrans carrying a monoazacrown moiety at the 8-position
- L43 ANSWER 25 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Intercalation and photochromism of spiropyrans on clay interlayers
- L43 ANSWER 26 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromism of spiropyrans in poly ion complex cast films
- L43 ANSWER 27 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Formation of head-to-tail and side-by-side aggregates of photochromic spiropyrans in bilayer membrane
- L43 ANSWER 28 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI **Thermal isomerization** of 1',3',3'-trimethyl-8-nitrospiro[2H-1-benzopyran-2,2'-indoline]-6-carboxylic acid
- L43 ANSWER 29 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI The structure of open merocyanine forms of photochromic indoline spiropyrans and the mechanism of their structural conversions
- L43 ANSWER 30 OF 39 HCA COPYRIGHT 2010 ACS on STN  
TI Rate control of **thermal isomerization** of a spirobenzopyran embedded in bilayer-immobilized cast film by the phase transition

L43 ANSWER 31 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Photodynamic macrocycles

L43 ANSWER 32 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Mechanism of photoisomerization and luminescence properties of  
 N-alkyl-6'-nitrospiro[indolino-2,2'-(2'H-1-benzopyrans)]

L43 ANSWER 33 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Mechanistic investigations of unimolecular reactions in liquid  
 crystalline solvents. Part I. The ~~thermal~~ syn →  
 anti ~~isomerization~~ of azobenzenes. Part II. The  
~~thermal isomerization~~ to  
 1',3',3'-trimethyl-6-nitrospiro[2H-benzopyran-2,2'-indoline] from its  
 merocyanine form

L43 ANSWER 34 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Relation between photochromism of chromophores and free volume theory  
 in bulk polymers

L43 ANSWER 35 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Photo-induced reversible change of wettability on photochromic polymer  
 surface

L43 ANSWER 36 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI 1-Octadecyl- and 3,3-diphenyl-substituted photochromic  
 indolinospirochromenes

L43 ANSWER 37 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Photoregulation of functional polymers

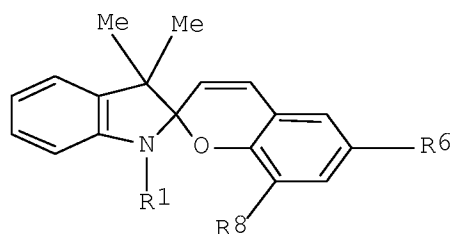
L43 ANSWER 38 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Absorption spectra and bleaching efficiency of spiranes under the  
 effect of photochromic transformations

L43 ANSWER 39 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 TI Photochromic transformations in a spiropyran solution using the  
 luminescence method

=> D L43 6,10 BIB ABS HITSTR HITIND

L43 ANSWER 6 OF 39 HCA COPYRIGHT 2010 ACS on STN  
 AN 134:334188 HCA Full-text  
 TI Photochromism of nitrospiropyrans: effects of structure, solvent and  
 temperature  
 AU Gorner, Helmut  
 CS Max-Planck-Institut fur Strahlenchemie, Mulheim an der Ruhr, D-45413,  
 Germany  
 SO Physical Chemistry Chemical Physics (2001), 3(3), 416-423  
 CODEN: PPCPFQ; ISSN: 1463-9076

PB Royal Society of Chemistry  
 DT Journal  
 LA English  
 GI



I

AB The thermal and photochem. ring opening and ring closure of the spiropyran/merocyanine couple of three nitro-substituted spiropyrans I [(6) R1' = Me, R6 = NO2, R8 = Br; (7) R1' = Me, R6 = NO2, R8 = COOCH3; and (8) R1' = Me, R6 = H, R8 = NO2] were studied and the results were compared with those of other 6-NO2 spirobenzopyranindolines (BIPS) I [(1) R1' = Me, R6 = NO2, R8 = H; (2) R1' = Me, R6 = NO2, R8 = CH2CH=CH2; (3) R1' = Me, R6 = NO2, R8 = OCH3; (4) R1' = C2H4OH, R6 = NO2, R8 = OCH3; (5) R1' = Ph, R6 = NO2, R8 = OCH3]. The photocoloration, which occurs in the triplet manifold throughout, and the photochem. conversion and thermal relaxation of the two observable photomerocyanines into the closed spiropyran (Sp) form (decoloration) were quantified as a function of solvent polarity and temp. The relaxation time ( $\tau_t$ -Sp) at 25°C ranges from 2 s for (5) in methylcyclohexane to 104 s for (7) in ethanol. This large variation in  $\tau_t$ -Sp is due to changes in both the activation energy ( $E_a$ =75-105 kJ mol<sup>-1</sup>, increasing with polarity) and the pre-exponential factor ( $A$ =10<sup>12</sup>-10<sup>15</sup> s<sup>-1</sup>). The quantum yield of coloration with 308 nm pulses is substantial in solvents of low polarity ( $\Phi_{col}$ =0.3-0.8) and decreases (<0.2) with increasing polarity. The obsd. merocyanine triplet state is rather short-lived (<10  $\mu$ s) and the precursor of the trans- and a cis-merocyanine. The same intermediates, the triplet state and the cis-isomer, were obsd. when the trans-merocyanine was excited at 530 nm. The thermal cis trans isomerization takes place in the  $\mu$ s-ms range and has an activation energy of  $E_c$  t=30-40 kJ mol<sup>-1</sup>. The effects of substituents and medium properties are described and the mechanism of photochromism is discussed.

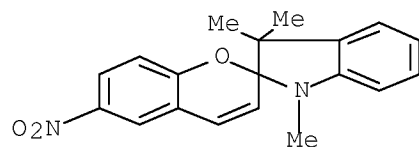
IT 1498-88-0 1498-89-1 42223-92-7

(photochromism of nitrospiropyrans: effects of structure, solvent and temp.)

RN 1498-88-0 HCA

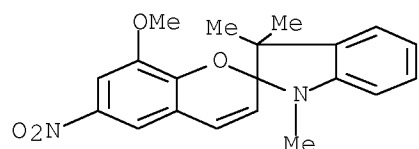
CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],

1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



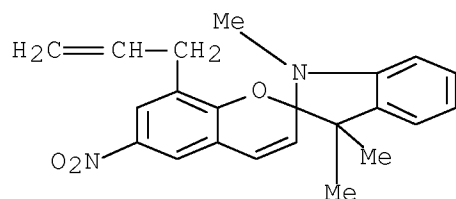
RN 1498-89-1 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-8-methoxy-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



RN 42223-92-7 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro-8-(2-propen-1-yl)- (CA INDEX NAME)

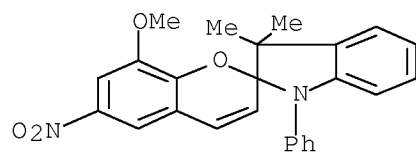


IT 2067-32-5 5150-50-5 10558-52-8  
34885-13-7 50839-67-3

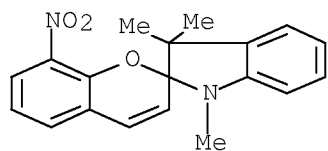
(photochromism of nitrospiropyrans: effects of structure, solvent and temp.)

RN 2067-32-5 HCA

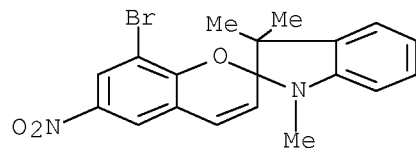
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-8-methoxy-3',3'-dimethyl-6-nitro-1'-phenyl- (CA INDEX NAME)



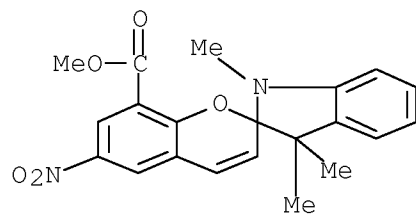
RN 5150-50-5 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1',3'-dihydro-1',3',3'-trimethyl-8-nitro- (CA INDEX NAME)



RN 10558-52-8 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 8-bromo-1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)

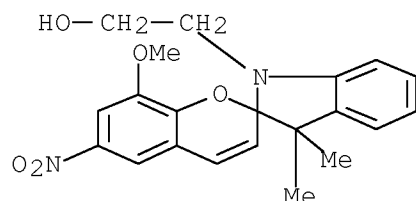


RN 34885-13-7 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole]-8-carboxylic acid,  
 1',3'-dihydro-1',3',3'-trimethyl-6-nitro-, methyl ester (CA INDEX  
 NAME)



RN 50839-67-3 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-ethanol,  
8-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



CC 74-9 (Radiation Chemistry, Photochemistry, and Photographic and Other  
Reprographic Processes)

Section cross-reference(s): 22, 73

IT 1498-88-0 1498-89-1 42223-92-7

(photochromism of nitrospiropyrans: effects of structure, solvent  
and temp.)

IT 2067-32-5 5150-50-5 10558-52-8

34885-13-7 50839-67-3

(photochromism of nitrospiropyrans: effects of structure, solvent  
and temp.)

OSC.G 46 THERE ARE 46 CAPLUS RECORDS THAT CITE THIS RECORD (46  
CITINGS)

RE.CNT 60 THERE ARE 60 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L43 ANSWER 10 OF 39 HCA COPYRIGHT 2010 ACS on STN

AN 133:254473 HCA Full-text

TI Photochromic molecular heat exchange medium

IN Sangster, Bruce; Bond, James D.

PA USA

SO U.S., 4 pp., Cont.-in-part of U.S. Ser. No. 674,183, abandoned.  
CODEN: USXXAM

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	US 6123868	A	20000926	US 1998-219540	19981222
PRAI	US 1995-437430	A2	19950505		
	US 1996-674183	B2	19960701		

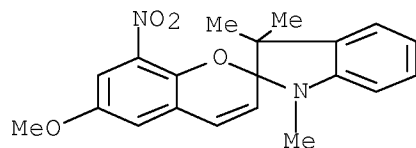
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A heat exchange medium is disclosed which utilizes a change in mol.  
configuration of photochromic compds. when they are exposed to light.  
Further, by the addn. of the photochromic compd. as a side chain to an org.  
polymer, the polymer can also be induced to change configuration and absorb  
larger amts. of heat.

IT 15735-51-0

(heat exchange medium comprising photochromic mol. with cis-trans

isomerization)  
RN 15735-51-0 HCA  
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-6-methoxy-1',3',3'-trimethyl-8-nitro- (CA INDEX NAME)



IC ICM C09K005-00  
INCL 252073000  
CC 48-5 (Unit Operations and Processes)  
Section cross-reference(s): 38, 73, 74  
IT **Isomerization**  
(cis-trans; heat exchange medium comprising photochromic  
mol. with)  
IT Concentration (condition)  
(of photochromic mol. with cis-trans isomerization in  
heat exchange medium)  
IT 103-33-3, Azobenzene 588-59-0, Stilbene 15735-51-0  
(heat exchange medium comprising photochromic mol. with cis-trans  
isomerization)  
RE.CNT 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

=> D L45 1-83 TI

L45 ANSWER 1 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Comprehensive Theoretical Study of the Conversion Reactions of  
Spiropyrans: Substituent and Solvent Effects

L45 ANSWER 2 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Heat-sealable dimming laminates

L45 ANSWER 3 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Multi-stack optical information carrier

L45 ANSWER 4 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Flexible optical modulation sheets with uniform thickness

L45 ANSWER 5 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Reversible thermochromic optical limiter

L45 ANSWER 6 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Synthesis and properties of thermo- and photochromic

bisindolinobenzospiropyrans linked by thio- and carbonyl groups

- L45 ANSWER 7 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Modulation of the Spiropyran-Merocyanine Reversion via Metal-Ion Selective Complexation: Trapping of the "Transient" cis-Merocyanine
- L45 ANSWER 8 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI **Thermochromic** and photochromic properties of some new spiropyran systems
- L45 ANSWER 9 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Tubular material having plurality of response functionalities
- L45 ANSWER 10 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Cholesteric copolymers with spiropyran side groups: effect of the dye structure on photo- and **thermochromic** properties
- L45 ANSWER 11 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Chromic compound having calix arene and spiropyran structures
- L45 ANSWER 12 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photosensitive cholesteric copolymers with spiropyran-containing side groups II. Kinetic features of the photo- and **thermo-chromic** processes
- L45 ANSWER 13 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI **Thermochromic** devices
- L45 ANSWER 14 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Synthesis and photochromic properties of benzocrown ether spirobenzopyrans
- L45 ANSWER 15 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Chiral 2H-pyrans. 8. 1',3',3'-Trimethyl-6,8-dinitrospiro[2H-1-benzopyran-2,2'-indoline]: fast thermal enantiomerization and slow thermal equilibration with a ring-opened isomer
- L45 ANSWER 16 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Structure and **thermochromism** of spiropyrans. Triplet mechanism of the thermal cleavage/closure of the pyran ring
- L45 ANSWER 17 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromism and **thermochromism** of phenanthrospirooxazine in poly(alkyl methacrylates)
- L45 ANSWER 18 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Dynamic behavior of sol-gel glass based **thermochromic** material applied toward development of practical optical temperature sensors
- L45 ANSWER 19 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photoprocesses in spiropyrans and their merocyanine isomers: effects

of temperature and viscosity

- L45 ANSWER 20 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Tuning reverse ring closure in the photochromic and **thermochromic** transformation of 1',3',3'-trimethyl-6-nitrospiro[2H-1-benzopyran- 2,2'-indoline] analogs by ionic moieties
- L45 ANSWER 21 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Optical memory effects in sol-gel gel-glass based **thermochromic** material
- L45 ANSWER 22 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Multichromic polymers for food packaging
- L45 ANSWER 23 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Synthesis and characterization of unsymmetrical bis-indolinospirobenzopyrans, a new class of **thermo-** and photo-**chromic** dyes
- L45 ANSWER 24 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI An effective method for the synthesis of new photo- and **thermochromic** dyes, unsymmetrical bis-indolinospirobenzopyrans
- L45 ANSWER 25 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic behavior of spiropyran in glass thin films formed by the sol-gel method
- L45 ANSWER 26 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI A new method for the determination of **thermochromic** equilibrium constant of indoline spiropyran
- L45 ANSWER 27 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI **Thermo**chromism of spiropyran and spirooxazine derivatives
- L45 ANSWER 28 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Synthesis and characterization of bis-indolinospirobenzopyrans, new photo- and **thermochromic** dyes
- L45 ANSWER 29 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Compositions containing a polymer and at least a radiation-sensitive component, process for marking polymer compositions, molded components containing the compositions, and articles containing the components
- L45 ANSWER 30 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photo- and **thermochromic** spirans. 18. Indolinospirochromenes containing  $\pi$ -acceptor substituents in position 8'
- L45 ANSWER 31 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Effect of the molecular structure and physical states on the chromism of spironaphthoxazines

L45 ANSWER 32 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Thermo- and photochromic dyes: spiro(indolinebenzopyrans). 2.  
Detailed assignment of the proton NMR spectra and structural aspects  
of the closed form of 1,3,3-trimethylspiro(indoline-2,2'-benzopyrans)

L45 ANSWER 33 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic, electrochromic, or **thermochromic** cards

L45 ANSWER 34 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Thermo- and photochromic dyes: indolino-benzospiropyran. Part 1.  
UV-VIS spectroscopic studies of  
1,3,3-spiro(2H-1-benzopyran-2,2'-indolines) and the open-chain  
merocyanine forms; solvatochromism and medium effects on spiro ring  
formation

L45 ANSWER 35 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Benzospiropyran as photochromic and/or **thermochromic**  
photoinitiators

L45 ANSWER 36 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Searching for photochromic liquid crystals. Spironaphthoxazine  
substituted with a mesogenic group

L45 ANSWER 37 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Substituent, heteroatom, and solvent effects on the thermal-bleaching  
kinetics and absorption spectra of photomerocyanines of the  
spiro[indoline-oxazine] series.

L45 ANSWER 38 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Investigations on the **thermochromism** of a series of  
spirocyclic compounds and color formers with heterocyclic parts and O  
or N as the key atom

L45 ANSWER 39 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Second harmonic generation by merocyanine in mesomorphic films. An  
anomalous electrostatic field effect

L45 ANSWER 40 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI **Thermochromic** recording materials

L45 ANSWER 41 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Mechanism of the photodestruction of spiropyran

L45 ANSWER 42 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromism of liquid-crystal polyacrylates containing spiropyran  
groups

L45 ANSWER 43 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic liquid crystals

L45 ANSWER 44 OF 83 HCA COPYRIGHT 2010 ACS on STN

TI Photo- and **thermochromic** liquid crystals

L45 ANSWER 45 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Goods having hidden marks

L45 ANSWER 46 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photo- and **thermo-chromic** liquid crystal polymers with spiropyran groups

L45 ANSWER 47 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI The dependence of the kinetic characteristics of **thermochromic** and photochromic transformations of spiropyrans on their structures

L45 ANSWER 48 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic and **thermochromic** pigments for solar absorbing-reflecting coatings

L45 ANSWER 49 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic and **thermochromic** liquid crystalline polysiloxanes

L45 ANSWER 50 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Physical crosslinking of mesomorphic polymers containing spiropyran groups

L45 ANSWER 51 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Reusable recording materials

L45 ANSWER 52 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photo- and **thermochromic** agents - mono- and bisindolinespirobenzopyrans

L45 ANSWER 53 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Devices for image formation

L45 ANSWER 54 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Devices for image formation

L45 ANSWER 55 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Kinetic studies of solvent and pressure effects on **thermochromic** behavior of 6-nitrospiropyran

L45 ANSWER 56 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Investigation of the quasi-liquid crystal structure

L45 ANSWER 57 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Method of image formation

L45 ANSWER 58 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Quasi-liquid crystals of **thermochromic** spiropyrans. A material intermediate between supercooled liquids and mesophases

L45 ANSWER 59 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Complexing of thermally induced colored form of 6-nitrospiropyrans in polar solvent

L45 ANSWER 60 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI A novel micrometal-imaging system based on photo- or electron-induced metallochromic phenomena in metal-laminated polymeric film

L45 ANSWER 61 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Effect of electron-donor and electron-acceptor substituents on photo- and **thermochromic** properties of indoline spiropyrans

L45 ANSWER 62 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI The application of electron-induced metallochromic reaction for metal image formation

L45 ANSWER 63 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Application of metallochromic compound for EBR medium. (IV). Formation of metal images due to electron-induced metallochromic processes

L45 ANSWER 64 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Acid catalysis in a **thermochromic** system

L45 ANSWER 65 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Applications of benzospiran chelate. V. A product on the surface of a copper-evaporated polymeric film by successive treatments of electron bombardment and heating

L45 ANSWER 66 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI A product on the surface of copper-evaporated polymeric film prepared by successive treatments of electron bombardment and heating

L45 ANSWER 67 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Ionomer compositions with reversible color changes

L45 ANSWER 68 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Study of **thermochromic** behavior of some indolinobenzospiropyrans by infrared spectroscopy

L45 ANSWER 69 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Visible phase holograms

L45 ANSWER 70 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photo- and **thermochromism**. II. Effect of conjugation on the absorption intensity of the nitro group of 8-bromo-1',3',3'-trimethyl-6-nitrospiro[chromene-2,2'-indoline]

L45 ANSWER 71 OF 83 HCA COPYRIGHT 2010 ACS on STN  
TI Photochromic-**thermochromic** coating composition for flaw detection

L45 ANSWER 72 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Photo- and **thermochromism**. I. Infrared spectra of  
 1',3',3'-trimethyl-6-nitro-8-bromospiro  
 [2H-1-benzopyran-2,2'-indoline] doped in polyacrylonitrile thin film

L45 ANSWER 73 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Nuclear magnetic resonance studies of the electrocyclic reactions of  
**thermochromic** spiropyrans

L45 ANSWER 74 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Synthesis of N-propyl and N-butyl derivatives of  
 spiro[indoline-2,2'-pyrans]

L45 ANSWER 75 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Photo- and **thermochromic** transients from substituted  
 1',3',3'-trimethylindolinobenzospiropyrans

L45 ANSWER 76 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Synthesis of N-ethyl spiropyrans of the indoline series

L45 ANSWER 77 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Photochemical study of a spiropyran adsorbed on silica gel

L45 ANSWER 78 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Photochromic chelating agents

L45 ANSWER 79 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Coating compositions for infrared thermography

L45 ANSWER 80 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Reversible molecular reactions and biochemical mechanisms

L45 ANSWER 81 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Low-energy configuration of photochromic molecules and corresponding  
 molecular mechanisms in quantum biology

L45 ANSWER 82 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI Some **thermochromic** spirans

L45 ANSWER 83 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 TI The color of organic compounds. V. **Thermochromic** spirans

=> D L45 2,3,8,13,18,21,33,45,54 BIB ABS HITSTR HITIND

L45 ANSWER 2 OF 83 HCA COPYRIGHT 2010 ACS on STN  
 AN 140:311761 HCA Full-text  
 TI Heat-sealable dimming laminates  
 IN Egashira, Noritaka; Baba, Atsushi; Tsuboi, Tatsuya  
 PA Dainippon Printing Co., Ltd., Japan  
 SO Jpn. Kokai Tokkyo Koho, 7 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	JP 2004109582	A	20040408	JP 2002-272916	20020919

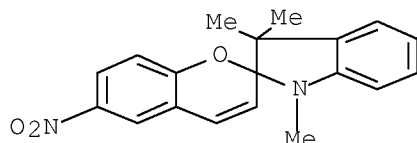
PRAI JP 2002-272916 20020919

AB The laminates, which are heat-sealable at any positions, have dimming layers, obtained from coloring compns. contg. dimming materials selected from (A) org. **thermochromic** materials of spiropyran-based condensed arom. compds., ethylene derivs., cholesteric liq. crystals, or leuco dyes, (B) inorg. **thermochromic** materials of metal complexes or metal salts, and (C) photochromic materials dispersed in polymers, sandwiched between substrates. The laminates are useful for heat-reflecting windows, dimming curtains, projection screens, automobile windows, etc. The laminates are cuttable at any positions.

IT 1498-88-0, SP 1  
(photochromic materials; heat-sealable **thermochromic** or photochromic material-based dimming laminates with good cutting property)

RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



IC ICM G02F001-17

ICS B32B027-18; C09K009-00; C09K009-02

CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

Section cross-reference(s): 74

ST heat sealable dimming laminate cutting property; **thermochromic** dimming laminate heat sealable cutting; photochromic dimming laminate heat sealable cutting

IT Liquid crystals  
(cholesteric; heat-sealable **thermochromic** or photochromic material-based dimming laminates with good cutting property)

IT Optical materials  
(dimming; heat-sealable **thermochromic** or photochromic material-based dimming laminates with good cutting property)

IT Laminated materials  
Leuco dyes  
Photochromic materials

#### Thermochromic materials

- (heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT Polyamides, uses
  - (heat-sealing agents; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT Aminoplasts
  - (microcapsules for thermochromic materials; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT Polyurethanes, uses
  - (polyurea-, microcapsules for photochromic materials; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT Polyureas
  - (polyurethane-, microcapsules for photochromic materials; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT Polyesters, uses
  - (substrates; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 9002-89-5P, Poly(vinyl alcohol) 660816-91-1P, Diazo PG-PVA 217EE copolymer
  - (binders; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 676998-76-8, FS 175R972
  - (heat-sealable layers; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 676998-83-7, PPET 2001
  - (heat-sealing agents; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 676578-74-8P
  - (microcapsules for photochromic materials; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 9003-08-1, Melamine resin
  - (microcapsules for thermochromic materials; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 1498-88-0, SP 1
  - (photochromic materials; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 25038-59-9, Poly(ethylene terephthalate), uses
  - (substrates; heat-sealable thermochromic or photochromic material-based dimming laminates with good cutting property)
- IT 660816-90-0, Daithermo DR 35 Violet C(TM)S
  - (thermochromic materials; heat-sealable thermochromic or photochromic material-based dimming

laminates with good cutting property)

L45 ANSWER 3 OF 83 HCA COPYRIGHT 2010 ACS on STN

AN 140:278490 HCA Full-text

TI Multi-stack optical information carrier

IN Busch, Christopher; Balistreri, Marcello L. M.; Peeters, Emiel;  
Wilderbeek, Johannes T. A.

PA Koninklijke Philips Electronics N.V., Neth.

SO PCT Int. Appl., 26 pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	WO 2004023466	A1	20040318	WO 2003-IB3405	20030804
	WO 2004023466	A9	20050407		
	AU 2003250426	A1	20040329	AU 2003-250426	20030804
	EP 1537570	A1	20050608	EP 2003-793935	20030804
	CN 1682295	A	20051012	CN 2003-821147	20030804
	JP 2005537954	T	20051215	JP 2004-533702	20030804
	US 20060013115	A1	20060119	US 2005-526181	20050301
PRAI	EP 2002-78676	A	20020906		
	WO 2003-IB3405	W	20030804		

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

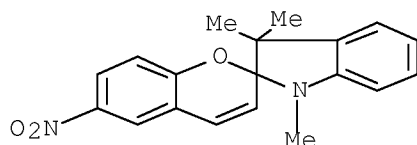
AB The present invention relates to a multi-stack optical information carrier for recording information by means of an optical beam, said optical information carrier comprising - a substrate layer (S), at least two recording stacks each comprising a recording layer, at least one spacer layer (R) sepg. two recording stacks, and a cover layer (C). In order to improve the sensitivity during writing it is proposed according to the present invention that the recording layers include a **thermochromic** material having temp.-dependent optical characteristics for selectively improving the sensitivity of the addressed recording layer during recording and/or read-out.

IT ~~1498-88-0~~

(multi-stack optical recording information carrier)

RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)

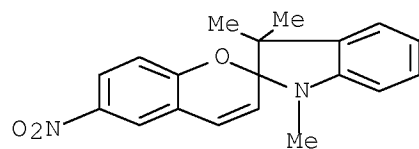


IC ICM G11B007-24

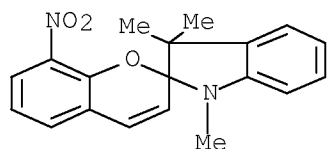
CC 74-12 (Radiation Chemistry, Photochemistry, and Photographic and Other

Reprographic Processes)  
ST optical information carrier recording disk **thermochromic**  
material WORM ROM  
IT **Thermochromic** materials  
(dyes; multi-stack optical recording information carrier)  
IT Dyes  
(**thermochromic**; multi-stack optical recording information  
carrier)  
IT 1498-88-0 1552-42-7 18457-95-9 159395-90-1  
(multi-stack optical recording information carrier)  
OSC.G 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)  
RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

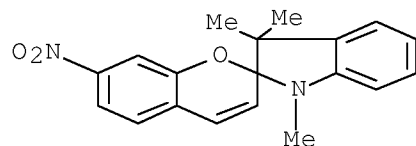
L45 ANSWER 8 OF 83 HCA COPYRIGHT 2010 ACS on STN  
AN 135:182056 HCA Full-text  
TI **Thermochromic** and photochromic properties of some new  
spiropyran systems  
AU Feng, K-C.; Griffiths, J.  
CS Department of Colour Chemistry, The University of Leeds, Leeds, LS2  
9JT, UK  
SO Advances in Colour Science and Technology (2001), 4(1),  
12-20  
CODEN: ACOSF9; ISSN: 1462-4761  
PB University of Leeds, Dep. of Colour Chemistry  
DT Journal  
LA English  
OS CASREACT 135:182056  
AB Several new annelated spiropyrans have been synthesized by condensing  
Fischer's base with the appropriate ortho-hydroxy formyl compds., and the  
color properties of the ring-opened merocyanines have been investigated. In  
general, only those spiro compds. contg. strong electron-withdrawing groups  
showed photochromism in soln. at room temp. In contrast, all the derivs.  
were **thermochromic** in soln. in the presence of phenol, and with one  
exception, the solns. showed a decrease in color intensity with increasing  
temp. Solvatochromism studies indicated that the merocyanine species were  
better represented by the more polar zwitterionic resonance form, and PPP-MO  
calcns. were in agreement with this, predicting an excited state with a  
lower dipole moment than the ground state. The MO method, assuming an all-  
trans planar geometry, predicted the color properties of the merocyanines  
satisfactorily.  
IT 1498-88-0P 5150-50-5P 20200-74-2P  
52607-60-0P 70310-99-5P  
(dye; prepn. and **thermochromic** and photochromic  
properties of spiropyran systems)  
RN 1498-88-0 HCA  
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



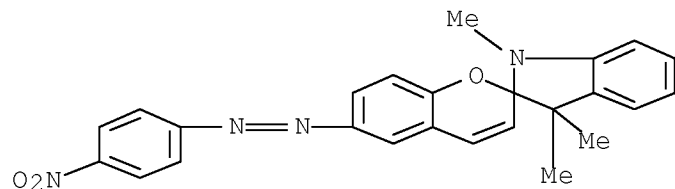
RN 5150-50-5 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1',3'-dihydro-1',3',3'-trimethyl-8-nitro- (CA INDEX NAME)



RN 20200-74-2 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1',3'-dihydro-1',3',3'-trimethyl-7-nitro- (CA INDEX NAME)

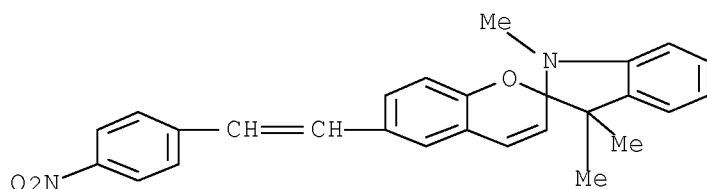


RN 52607-60-0 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1',3'-dihydro-1',3',3'-trimethyl-6-[2-(4-nitrophenyl)diazenyl]- (CA  
 INDEX NAME)



RN 70310-99-5 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],

1',3'-dihydro-1',3',3'-trimethyl-6-[2-(4-nitrophenyl)ethenyl]- (CA  
INDEX NAME)



- CC 41-11 (Dyes, Organic Pigments, Fluorescent Brighteners, and  
Photographic Sensitizers)  
Section cross-reference(s): 27, 73
- ST spiropyran merocyanine dye prepn **thermochromism**  
photochromism; solvatochromism spiropyran merocyanine dye
- IT Photochromic materials  
**Thermochromic** materials  
(dyes; prepn. and **thermochromic** and photochromic  
properties of spiropyran systems)
- IT PPP (molecular orbital)  
Photochromism  
Solvatochromism  
**Thermochromism**  
(of spiropryan/merocyanine dyes)
- IT Dyes  
(photochromic; prepn. and **thermochromic** and photochromic  
properties of spiropyran systems)
- IT Cyanine dyes  
(prepn. and **thermochromic** and photochromic properties of  
spiropyran systems)
- IT Tautomers  
(ring-chain; in **thermochromic** and photochromic properties  
of spiropyran systems)
- IT Dyes  
(**thermochromic**; prepn. and **thermochromic** and  
photochromic properties of spiropyran systems)
- IT 354999-42-1P 354999-43-2P 354999-44-3P 354999-45-4P  
354999-47-6P 354999-48-7P 354999-49-8P 354999-50-1P  
354999-51-2P 354999-52-3P 354999-53-4P 354999-54-5P  
354999-55-6P 354999-56-7P 354999-57-8P 354999-58-9P  
(dye merocyanine form; prepn. and **thermochromic** and  
photochromic properties of spiropyran systems)
- IT 97-51-8P 708-06-5P 1761-63-3P 2067-86-9P 2460-58-4P  
5274-70-4P 17754-90-4P 27147-03-1P 32041-64-8P 160517-12-4P  
163068-65-3P 354999-59-0P 354999-60-3P 354999-61-4P  
354999-62-5P 354999-64-7P  
(dye precursor; prepn. and **thermochromic** and photochromic  
properties of spiropyran systems)
- IT 1498-88-0P 1592-43-4P 5150-50-5P

20200-74-2P 52607-59-7P 52607-60-0P 57771-17-2P  
70310-99-5P 153913-03-2P 354999-12-5P 354999-15-8P  
354999-31-8P 354999-34-1P 354999-36-3P 354999-39-6P  
354999-41-0P

(dye; prepn. and thermochromic and photochromic  
properties of spiropyran systems)

IT 86-77-1, 2-Dibenzofuranol 88-75-5 91-68-9 92-69-3,  
[1,1'-Biphenyl]-4-ol 92-80-8 93-35-6 100-02-7, reactions  
131-56-6 135-19-3, 2-Naphthalenol, reactions 554-84-7 607-45-4  
1435-60-5 1689-82-3 3785-90-8 5472-84-4 19221-08-0

(prepn. and thermochromic and photochromic properties of  
spiropyran systems)

IT 118-12-7, Fischer's base  
(starting material; prepn. and thermochromic and  
photochromic properties of spiropyran systems)

OSC.G 4 THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD (4 CITINGS)

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD

ALL CITATIONS AVAILABLE IN THE RE FORMAT

L45 ANSWER 13 OF 83 HCA COPYRIGHT 2010 ACS on STN

AN 132:297426 HCA Full-text

TI Thermochromic devices

IN Byker, Harlan J.; Ogburn, Paul H.

PA Pleotint, L.L.C., USA

SO PCT Int. Appl., 75 pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	WO 2000021748	A1	20000420	WO 1999-US24135	19991015
	US 6084702	A	20000704	US 1998-173414	19981015
	CA 2346764	A1	20000420	CA 1999-2346764	19991015
	CA 2346764	C	20090623		
	AU 9965184	A	20000501	AU 1999-65184	19991015
	EP 1133391	A1	20010919	EP 1999-953193	19991015
	EP 1133391	B1	20050928		
	JP 2002527326	T	20020827	JP 2000-575689	19991015
	AT 305383	T	20051015	AT 1999-953193	19991015
	US 6446402	B1	20020910	US 2000-608248	20000630
	MX 2001003739	A	20020918	MX 2001-3739	20010411
PRAI	US 1998-173414	A	19981015		
	WO 1999-US24135	W	19991015		

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A thermochromic device comprises a light transmitting substrate,  $\geq 1$   
thermochromic material which changes reversibly from less light energy  
absorbing to more light energy absorbing as its temp. increases, and  $\geq 1$   
material with residual light energy absorbing character.

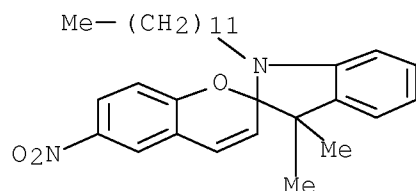
IT 87524-69-4, Chroma Dye 37

(Chroma 37; thermochromic devices and windows that allow

sunlight into building when ambient temp. is low and substantially  
block solar radiation at high ambient temp.)

RN 87524-69-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1'-dodecyl-1',3'-dihydro-3',3'-dimethyl-6-nitro- (CA INDEX NAME)

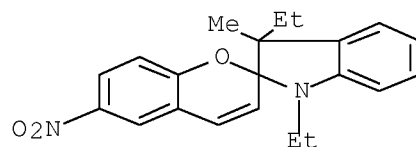


IT 264622-31-3, Chroma Dye 47

(Chroma 47; **thermochromic** devices and windows that allow  
sunlight into building when ambient temp. is low and substantially  
block solar radiation at high ambient temp.)

RN 264622-31-3 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-diethyl-1',3'-dihydro-3'-methyl-6-nitro- (CA INDEX NAME)

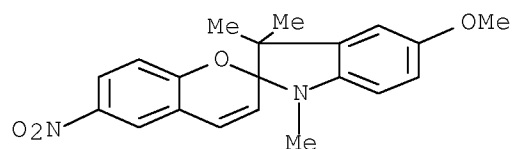


IT 16331-96-7, Chroma Dye 88

(Chroma 88; **thermochromic** devices and windows that allow  
sunlight into building when ambient temp. is low and substantially  
block solar radiation at high ambient temp.)

RN 16331-96-7 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-5'-methoxy-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



IC ICM B32B017-06

ICS C03C017-28; C03C017-00; C03C017-34; C03C017-42

CC 57-1 (Ceramics)  
Section cross-reference(s): 58

ST **thermochromic** window sunlight energy absorption controlled

IT UV radiation  
(barriers for; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT Glass, uses  
(low-emissivity, Energy Advantage Low-E, EverGreen; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT Heat transfer  
**Thermochromic** materials  
Windows  
(**thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT Polyvinyl butyrals  
(**thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 87524-69-4, Chroma Dye 37  
(Chroma 37; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 264622-31-3, Chroma Dye 47  
(Chroma 47; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 16331-96-7, Chroma Dye 88  
(Chroma 88; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 264617-85-8  
(Reversacol Aqua Green; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 160451-52-5  
(Reversacol Palatinate Purple; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 159256-78-7  
(Reversacol Sea Green; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 8003-22-3, Solvent Yellow 33  
(quinoline yellow; **thermochromic** devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 7429-90-5, Aluminum, uses  
(**thermochromic** devices and windows that allow sunlight

into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 207621-10-1, C.I. Solvent Green 34  
(thermochromic devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 63843-89-0  
(thermochromic devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

IT 67-63-0, Isopropyl alcohol, uses 67-64-1, Acetone, uses 108-32-7, Propylene carbonate 128-37-0, 2,6-Di-tert-butyl-4-methylphenol, uses 141-78-6, Ethylacetate, uses 628-63-7, Amylacetate 1843-05-6, 2-Hydroxy-4-octyloxybenzophenone 7439-90-9, Krypton, uses 9002-98-6D, methoxysilylpropyl modified 9003-20-7, Poly(vinyl acetate) 9011-14-7, Polymethylmethacrylate 133960-40-4, 4,6-Dinitro-4'-methyl-2,2'-azodiphenol 136457-10-8, Tinuvin 213 209066-38-6, C.I. Solvent Green 35 209066-48-8, C.I. Solvent Violet 55 264618-11-3, Keysorb 1026 264618-17-9, Fastbond 30NF  
(thermochromic devices and windows that allow sunlight into building when ambient temp. is low and substantially block solar radiation at high ambient temp.)

OSC.G 18 THERE ARE 18 CAPLUS RECORDS THAT CITE THIS RECORD (18 CITINGS)

RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L45 ANSWER 18 OF 83 HCA COPYRIGHT 2010 ACS on STN

AN 129:348885 HCA Full-text

OREF 129:70913a,70916a

TI Dynamic behavior of sol-gel gel-glass based thermochromic material applied toward development of practical optical temperature sensors

AU Matias, Ignacio R.; Lopez-Amo, Manuel; Fiksman, Gennady; Oton, Jose M.; Levy, David; Del Monte, Francisco

CS Universidad Publica de Navarra, Departamento de Ingenieria Electrica y Electronica, Pamplona, 31006, Spain

SO Optical Engineering (Bellingham, Washington) (1998), 37(9), 2620-2624

CODEN: OPEGAR; ISSN: 0091-3286

PB SPIE-The International Society for Optical Engineering

DT Journal

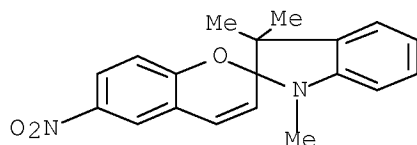
LA English

AB A newly developed sol-gel gel-glass based thermochromic material is studied from the point of view of its application to temp. sensors. This work shows the dynamic response of the thermochromic material both to temp. and to light radiation, exhibiting high repeatability. Also it is possible to store the max. achieved temp. values.

IT 1498-88-0

(dynamic behavior of sol-gel gel-glass based thermochromic material applied toward development of practical optical temp. sensors and contg.)

RN 1498-88-0 HCA  
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)  
ST sol gel glass **thermochromic** temp sensor  
IT Sol-gel processing  
(gel-glass based **thermochromic** material dynamic behavior  
applied toward development of practical optical temp. sensors)  
IT Organic glasses  
(gel; sol-gel based **thermochromic** material dynamic  
behavior applied toward development of practical optical temp.  
sensors)  
IT Gels  
(glass; sol-gel based **thermochromic** material dynamic  
behavior applied toward development of practical optical temp.  
sensors)  
IT Thermometers  
(optical; dynamic behavior of sol-gel gel-glass based  
**thermochromic** material applied toward development of  
practical)  
IT **Thermochromic** materials  
(sol-gel gel-glass based; dynamic behavior applied toward  
development of practical optical temp. sensors)  
IT 1498-88-0  
(dynamic behavior of sol-gel gel-glass based **thermochromic**  
material applied toward development of practical optical temp.  
sensors and contg.)  
OSC.G 11 THERE ARE 11 CAPLUS RECORDS THAT CITE THIS RECORD (11  
CITINGS)  
RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT  
  
L45 ANSWER 21 OF 83 HCA COPYRIGHT 2010 ACS on STN  
AN 127:142560 HCA Full-text  
OREF 127:27379a,27382a  
TI Optical memory effects in sol-gel gel-glass based  
**thermochromic** material  
AU Fiksman, Gennady; Datta, Partha; Oton, Jose M.; Matias, Ignacio R.;  
Lopez-Amo, Manuel; Del Monte, Francisco; Levy, David  
CS Departamento de Tecnologia Fotonica, Ciudad Universitaria, E.T.S.I.  
Telecomunicacion, Madrid, 28040, Spain

SO Optical Engineering (Bellingham, Washington) (1997), 36(6),  
1766-1769  
CODEN: OPEGAR; ISSN: 0091-3286

PB SPIE-The International Society for Optical Engineering

DT Journal

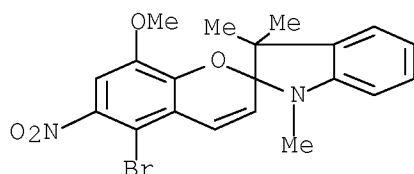
LA English

AB Optical memory effects in the newly developed sol-gel gel-glass based  
thermochromic material were studied. Several fundamental material  
parameters, which contribute to the formation of two stable states in this  
substance are quant. measured. Simple writing and erasing methods along  
with the long term stability of each memory state are demonstrated.

IT 7410-36-8  
(optical memory using sol-gel gel-glass with thermochromic  
dopant)

RN 7410-36-8 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
5-bromo-1',3'-dihydro-8-methoxy-1',3',3'-trimethyl-6-nitro- (CA INDEX  
NAME)



CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related  
Properties)  
Section cross-reference(s): 57, 74

ST optical memory thermochromic sol gel glass

IT Absorption spectra  
(UV and visible; of sol-gel gel-glass optical memory using  
thermochromic dopant)

IT UV and visible spectra  
(absorption; of sol-gel gel-glass optical memory using  
thermochromic dopant)

IT Sol-gel processing  
Thermochromic materials  
(optical memory in sol-gel gel-glass based thermochromic  
material)

IT Glass, properties  
(sol-gel; optical memory in sol-gel gel-glass based  
thermochromic material)

IT Optical memory devices  
(thermochromic memory cell using doped sol-gel gel-glass)

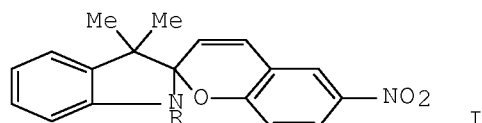
IT 7410-36-8  
(optical memory using sol-gel gel-glass with thermochromic  
dopant)

OSC.G 6 THERE ARE 6 CAPLUS RECORDS THAT CITE THIS RECORD (6 CITINGS)

RE.CNT 6      THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L45 ANSWER 33 OF 83 HCA COPYRIGHT 2010 ACS on STN  
AN 117:101124 HCA Full-text  
OREF 117:17407a,17410a  
TI Photochromic, electrochromic, or ~~thermo~~chromic cards  
IN Ando, Eiji; Hibino, Junichi; Moriyama, Kumiko  
PA Matsushita Denki Sangyo K. K., Japan  
SO Jpn. Kokai Tokkyo Koho, 7 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	---	-----	-----	-----
PI	JP 04098245	A	19920330	JP 1990-216852	19900816
PRAI	JP 1990-216852		19900816		
GI					



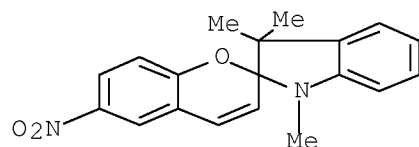
AB Claimed are cards which have a display layer whose color is changed by either an optical, thermal, or elec. means. Also claimed are cards contg. an indoline deriv. I ( $R = C_nH_{2n+1}$ ;  $n = 1$  to 23). The title cards are used as credit cards.

IT 1498-88-0

(photochromic cards contg.)

RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



IC ICM G03C001-685

ICS B41M005-26; G02F001-15; G02F001-17

CC 74-9 (Radiation Chemistry, Photochemistry, and Photographic and Other

Reprographic Processes)  
 ST photochromic card; **thermochromic** card; electrochromic card;  
 credit card  
 IT Cards  
 (credit, photochromic, **thermochromic** or electrochromic  
 substances for)  
 IT ~~1498-88-0~~ 72493-39-1  
 (photochromic cards contg.)  
 OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L45 ANSWER 45 OF 83 HCA COPYRIGHT 2010 ACS on STN

AN 110:97325 HCA Full-text

OREF 110:16073a,16076a

TI Goods having hidden marks

IN Akashi, Ryojiro; Taniguchi, Takashi

PA Toray Industries, Inc., Japan

SO Jpn. Kokai Tokkyo Koho, 4 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

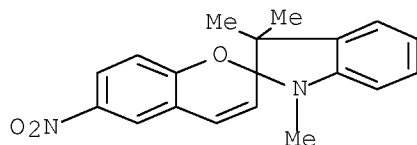
	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	JP 63218285	A	19880912	JP 1987-50680	19870305
	JP 08004778	B	19960124		
PRAI	JP 1987-50680		19870305		

AB The goods are marked with compns. changing from colorless to colored, contg. photochromic or **thermochromic** compds., the color of which disappears in >1 min and <3 mo at room temp. A soln. contg. 6'-nitro-1,3,3-trimethylindolinespirobenzopyran 1, polystyrene 10, and toluene 50 parts was coated on glass and irradiated in the UV range to show a blue color, which disappeared after 2 h and reappeared upon further irradiation.

IT ~~1498-88-0~~  
 (coatings contg. polystyrene and, photochromic, for secret marking  
 of articles)

RN 1498-88-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole],  
 1',3'-dihydro-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



IC ICM B05D007-24

ICS B05D005-06; G09F003-00

ICA B32B007-02; B32B033-00

CC 42-10 (Coatings, Inks, and Related Products)

Section cross-reference(s): 74  
 ST photochromic compd coating material; ~~thermochromic~~ compd  
 coating material; polystyrene nitrotrimethylindolinespirobenzopyran  
 coating material  
 IT ~~Thermochromic~~ substances  
 (coatings contg., for secret marking of articles)  
 IT 1498-88-0  
 (coatings contg. polystyrene and, photochromic, for secret marking  
 of articles)

L45 ANSWER 54 OF 83 HCA COPYRIGHT 2010 ACS on STN

AN 106:93700 HCA Full-text

OREF 106:15199a,15202a

TI Devices for image formation

IN Nishimura, Yukio; Nakagiri, Takashi; Sakai, Kunihiro; Tomita,  
 Yoshinori; Eguchi, Takeshi; Saito, Kenji

PA Canon K. K., Japan

SO Jpn. Kokai Tokkyo Koho, 11 pp.

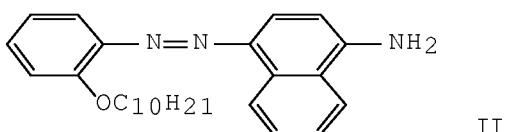
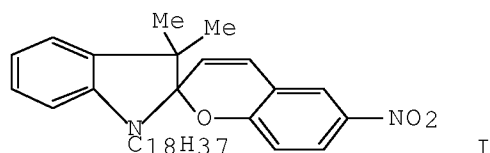
CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	JP 61176925	A	19860808	JP 1985-17036	19850131
PRAI	JP 1985-17036		19850131		
GI					



AB The title devices consist of (1) an image-forming layer composed of an amphiphilic functional mol. and a phase-transition type amphiphilic org. mol. having unsatd. bond(s), and (2) a heating element, preferably a radiation-absorbing layer, which is to provide thermal energy to the image-forming layer. The image-forming layer is locally fluidized by heating, and the functional mol. thereby becomes reactive to external signals. The devices give high-contrast images, and esp. are useful for color display and recording. Thus, a glass substrate was coated with (1) an IR-absorbing SiO<sub>2</sub> layer prepd. by sputtering, and (2) an image-forming layer consisting of 21 Langmuir-Blodgett monolayers of a 1:1 mixt. of the spiropyran compd. I and the azo compd. II, and covered with a protective glass plate to obtain a device for image formation; then the device was exposed to a polychromatic

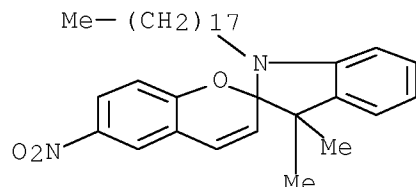
light with wavelengths in the 356 and 850 nm range to give a clear blue image.

IT 70877-18-8

(photothermog. imaging material contg.)

RN 70877-18-8 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-octadecyl- (CA INDEX NAME)



IC ICM G03C001-72

ICS B41M005-26; G11B007-24

CC 74-7 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)

IT Optical imaging devices  
(thermochromic, high-contrast)

IT 2027-47-6 13296-76-9 70877-18-8 106463-02-9

106463-03-0 106776-21-0

(photothermog. imaging material contg.)

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#### CLAIM 9 AND RELATED

=> D L31 1-6 BIB ABS HITSTR HITRN

L31 ANSWER 1 OF 6 HCA COPYRIGHT 2010 ACS on STN

AN 143:231562 HCA Full-text

TI Time-temperature indicator based on valence isomerizations

IN Levy, Yoav; Haarer, Dietrich

PA Freshpoint Holdings S. A., Switz.

SO PCT Int. Appl., 58 pp.

CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	WO 2005075978	A2	20050818	WO 2005-EP50291	20050124
	WO 2005075978	A3	20051006		
	AU 2005210754	A1	20050818	AU 2005-210754	20050124
	EP 1711809	A2	20061018	EP 2005-701597	20050124

CN 1914509	A	20070214	CN 2005-80003805	20050124
JP 2007531873	T	20071108	JP 2006-551838	20050124
US 20070172951	A1	20070726	US 2006-587586	20060728
IN 2006CN02822	A	20070608	IN 2006-CN2822	20060801
MX 2006008688	A	20070216	MX 2006-8688	20060802
KR 2006124740	A	20061205	KR 2006-717818	20060901
PRAI US 2004-540558P	P	20040202		
US 2004-564232P	P	20040422		
WO 2005-EP50291	W	20050124		

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

OS MARPAT 143:231562

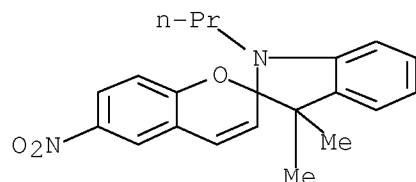
AB The present invention relates to a time temp. indicator comprising at least one indicator compd. in a first isomeric form, which is converted into a second isomeric form of the indicator compd. (e.g., a diarylethene or a spiroarom. compd.) in a valence isomerization reaction without migration of an atom or chem. group attached to said indicator compd. in a time and temp. dependent manner, wherein the formation of the second isomeric form is detectable by monitoring a phys. characteristic of the indicator. The present invention also relates to a method of manufg. such a time-temp. indicator comprising the steps of (a) embedding in or atop a matrix said indicator compd.; and (b) inducing the formation of a metastable state of said embedded indicator compd.

IT ~~28999-46-4P~~

(time-temp. indicator based on valence isomerizations)

RN 28999-46-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)



IT ~~28999-46-4P~~

(time-temp. indicator based on valence isomerizations)

OSC.G 6 THERE ARE 6 CAPLUS RECORDS THAT CITE THIS RECORD (6 CITINGS)

RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD

ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 2 OF 6 HCA COPYRIGHT 2010 ACS on STN

AN 136:142492 HCA Full-text

TI Site effects in controlling the chemical reactivity in crystals:  
solid-state photochromism of N-(n-propyl)nitrospiropyrane

AU Godsi, Oded; Peskin, Uri; Kapon, Moshe; Natan, Ezra; Eichen, Yoav

CS Department of Chemistry, Technion-Israel Institute of Technology,  
Technion City, Haifa, 32000, Israel

SO Chemical Communications (Cambridge, United Kingdom) (2001),

(20), 2132-2133

CODEN: CHCOFS; ISSN: 1359-7345

PB Royal Society of Chemistry

DT Journal

LA English

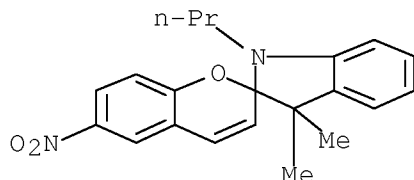
AB The dynamics of decay of the photoproducts of the two non equiv. mols. of N-(n-propyl) nitrospiropyrane in the cryst. state is significantly different due to the effect of the specific site where each of the mols. is located in the crystal lattice.

IT 28999-46-4

(site effects in controlling chem. reactivity in crystals:  
solid-state photochromism of N-(n-propyl)nitrospiropyrane)

RN 28999-46-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)



IT 28999-46-4

(site effects in controlling chem. reactivity in crystals:  
solid-state photochromism of N-(n-propyl)nitrospiropyrane)

OSC.G 8 THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD (8 CITINGS)

RE.CNT 32 THERE ARE 32 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L31 ANSWER 3 OF 6 HCA COPYRIGHT 2010 ACS on STN

AN 105:181615 HCA Full-text

OREF 105:29141a,29144a

TI Reversible recording materials

IN Niwa, Toshio; Murata, Yukichi; Maeda, Shuichi

PA Mitsubishi Chemical Industries Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 5 pp.

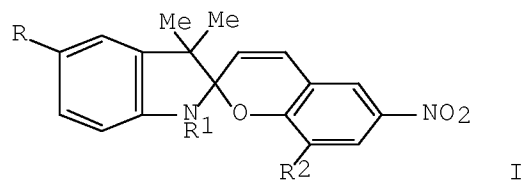
CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	JP 61067848	A	19860408	JP 1984-190405	19840911
PRAI	JP 1984-190405		19840911		
GI					



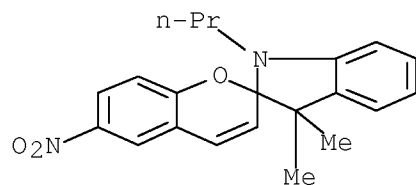
AB The recording layer of reversible recording materials contains a thermoplastic polyester and a spiropyran compd. having the general formula I (R = H, halo, alkyl, alkoxy, alkoxy carbonyl; R1 = alkyl; R2 = H, halo, alkyl, alkoxy). The materials that record by UV irradiation produce high-contrast and stable images that can be erased by heat or visible light and are used as memory materials, copying and printing materials, photosensitive materials, and dosimetric and display materials. Thus, a recording material was prepared by coating a 100- $\mu$  polyester sheet with a solution of 0.8 g of I (R = Cl; R1 = Me; R2 = H) and 3.5 g of a polyester (Vylon 200) in MEK. UV irradiation for 1 min produced a blue-purple coloration (max. absorption 600 nm). Heating at 110° erased the image, and the material was then reused.

IT 28999-46-4

(UV-sensitive reversible color-forming compounds. containing thermoplastic polyester and, for recording materials)

RN 28999-46-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)



IT 28999-46-4

(UV-sensitive reversible color-forming compounds. containing thermoplastic polyester and, for recording materials)

L31 ANSWER 4 OF 6 HCA COPYRIGHT 2010 ACS on STN

AN 96:162010 HCA [Full-text](#)

OREF 96:26655a,26658a

TI Carbon-13 NMR spectra of spirochromenes of the indoline series.  
Weak-field portion of the spectrum

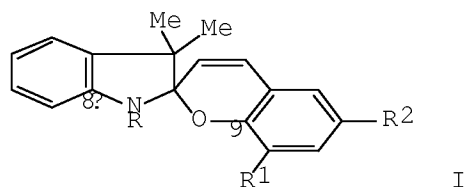
AU Tsitsishvili, V. G.; Shishkin, L. P.

CS Inst. Farmakokhim. im. Kutateladze, Tbilisi, USSR

SO Izvestiya Akademii Nauk Gruzinskoi SSR, Seriya Khimicheskaya (1981), 7(4), 332-8

CODEN: IGSKDH; ISSN: 0132-6074

DT Journal  
LA Russian  
GI



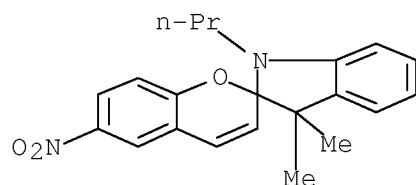
AB The  $^{13}\text{C}$  NMR spectra of title compds. I ( $\text{R} = \text{Me}, \text{Pr}, \text{Bu}, \text{pentyl}, \text{Ph}$ ;  $\text{R}_1 = \text{H}, \text{Br}, \text{NO}_2$ ;  $\text{R}_2 = \text{H}, \text{Cl}, \text{Br}, \text{NO}_2$ ) were recorded in  $\text{CDCl}_3$ ,  $\text{C}_6\text{D}_6$ , or  $(\text{CD}_3)_2\text{CO}$ . The solvent effect was largest on the C-8' and C-9 resonances. The latter was also affected by  $\text{R}_2$ . Of the substituents,  $\text{R}_2$  exerted the largest effect on the resonance lines, esp. for I ( $\text{R}_2 = \text{Br}$ ).

IT 28999-46-4

(NMR of carbon-13 in)

RN 28999-46-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)



IT 28999-46-4

(NMR of carbon-13 in)

L31 ANSWER 5 OF 6 HCA COPYRIGHT 2010 ACS on STN

AN 76:25082 HCA Full-text

OREF 76:4074h,4075a

TI Synthesis and some physicochemical properties of  
6-nitro-2H-chromene-2-spiro-2'-N-alkyl-3',3'-dimethylindolines

AU Dzhabaridze, K. G.; Maisuradze, D. P.; Gachechiladze, G. G.;  
Gomelauri, E. S.

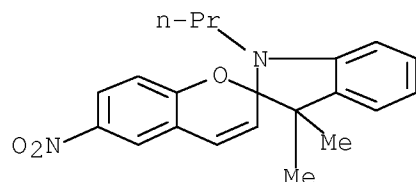
CS Inst. Kibern., Tbilisi, USSR

SO Khimiya Geterotsiklicheskikh Soedinenii (1971), 7(6), 775-7

CODEN: KGSSAQ; ISSN: 0132-6244

DT Journal

LA Russian  
 GI For diagram(s), see printed CA Issue.  
 AB The title compds. (I) (R = Et, Pr, Bu, C<sub>5</sub>H<sub>11</sub>, C<sub>6</sub>H<sub>13</sub>, C<sub>7</sub>H<sub>15</sub>, C<sub>8</sub>H<sub>17</sub>, C<sub>9</sub>H<sub>19</sub>, C<sub>10</sub>H<sub>21</sub>, Ph) were obtained by condensation in a neutral alc. medium of 5-nitrosalicylaldehyde with the corresponding N-alkyl-2-methylene-3,3-dimethylindolines. I (except R = Et and Ph) show photochromic properties both in the cryst. state and in soln. The photochromic properties are esp. pronounced in I with large alkyl radicals. Also, 6-nitro-2H-chromene-2-spiro-2' - N - methylindoline-3'-spiro-1''-cyclohexane was synthesized which exhibits photochromic properties both in the cryst. state and in soln.  
 IT ~~28999-46-4P~~  
 (prepn. of)  
 RN 28999-46-4 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)



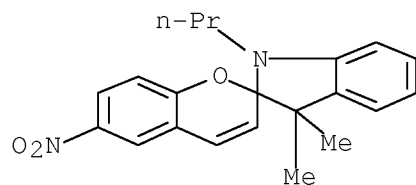
IT ~~28999-46-4P~~  
 (prepn. of)  
 OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L31 ANSWER 6 OF 6 HCA COPYRIGHT 2010 ACS on STN  
 AN 73:30621 HCA Full-text  
 OREF 73:5079a,5082a  
 TI Photochromic properties of some spiropyrans  
 AU Dzhabaridze, K. G.; Pavlenishvili, I. Ya.; Gugava, M. T.; Maisuradze, D. P.  
 CS Inst. Kibern., Tbilisi, USSR  
 SO Zhurnal Fizicheskoi Khimii (1970), 44(3), 582-5  
 CODEN: ZFKHA9; ISSN: 0044-4537  
 DT Journal  
 LA Russian  
 GI For diagram(s), see printed CA Issue.  
 AB Spiropyranes of general structures I and II, become colored on uv irradiation; most of them show photochromic properties at room temp. The coloration of I and II is accompanied by the appearance of a band at 1220 cm<sup>-1</sup> in the ir spectra as well as by the gradual disappearance of C:C stretching bands at 1580 and 1650 cm<sup>-1</sup>. The changes in the spectra are reversible. The uv radiation causes spiran ring opening, and the colored form is probably a mixt. of cis and trans isomers of the open form of spirans. Prolonged irradiation shifts the equil. towards the more stable transform. R is C<sub>2</sub>-7 alkyl or Ph, R<sub>1</sub> and R<sub>2</sub> are H, Br, (1, NO<sub>2</sub>, or methoxy groups).  
 IT ~~28999-46-4~~

(photochromism of)

RN 28999-46-4 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-propyl- (CA INDEX NAME)



IT 28999-46-4

(photochromism of)

OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

=> D L40 1-5 BIB ABS HITSTR HITRN

L40 ANSWER 1 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 124:234853 HCA Full-text

OREF 124:43491a,43494a

TI Synthesis and characterization of unsymmetrical  
bis-indolinospirobenzopyrans, a new class of ~~thermo~~- and  
photo-~~chromic~~ dyes

AU Keum, Sam-Rok; Lim, Soon-Sung; Min, Byung-Hun; Kazmaier, Peter M.;  
Buncel, Erwin

CS Dep. Chem., Grad. Stud. Korea Univ., Seoul, 136-701, S. Korea

SO Dyes and Pigments (1996), 30(3), 225-34

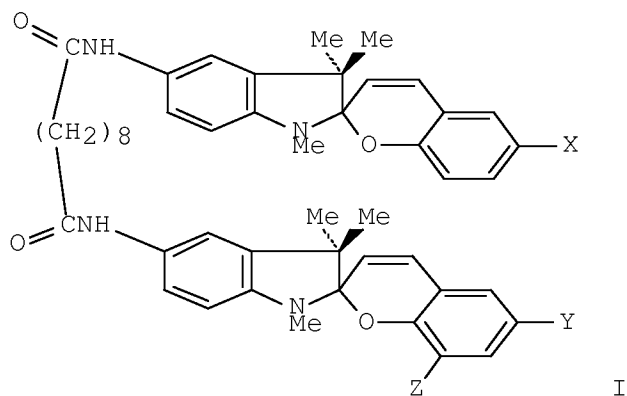
CODEN: DYPIDX; ISSN: 0143-7208

PB Elsevier

DT Journal

LA English

GI



AB The unsym. bis-indolinobenzospiropyran dyes (I; X = H, Me; Y = I, NO<sub>2</sub>; Z = H, I, NO<sub>2</sub>) and their precursors have been synthesized. I are obtained by condensation of the precursor, Fischer base-spiropyran derivs. with substituted salicylaldehydes. An alternative Fischer base-spiropyran precursor, which has an electron-withdrawing substituent, was not found to be suitable for the synthesis of I. The synthesized I have been characterized by <sup>1</sup>H NMR, UV-visible, and mass spectroscopy; they show abnormal solvatokinetic behavior in nonpolar solvents, suggestive of aggregate formation.

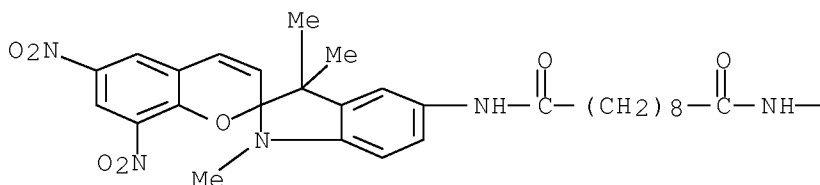
IT 172272-86-5P

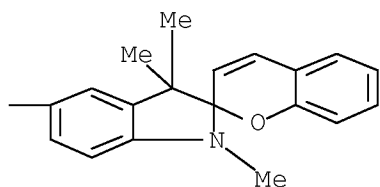
(prepn. of unsym. bis-indolinobenzospiropyran solvato-, thermo- and photochromic dyes)

RN 172272-86-5 HCA

CN Decanediamide, N1-(1',3'-dihydro-1',3',3'-trimethyl-6,8-dinitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-5'-yl)-N10-(1',3'-dihydro-1',3',3'-trimethylspiro[2H-1-benzopyran-2,2'-[2H]indol]-5'-yl)- (CA INDEX NAME)

PAGE 1-A





IT 172272-86-5P

(prepn. of unsym. bis-indolinospirobenzopyran solvato-, thermo- and photochromic dyes)

OSC.G 14 THERE ARE 14 CAPLUS RECORDS THAT CITE THIS RECORD (14 CITINGS)

L40 ANSWER 2 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 124:59068 HCA Full-text

OREF 124:11112h,11113a

TI An effective method for the synthesis of new photo- and ~~thermo~~chromic dyes, unsymmetrical bis-indolinospirobenzopyrans

AU Keum, Sam-Rok; Lim, Soon-Sung; Min, Byung-Hun

CS Dep. of Chemistry, Korea Univ., Choong-Nam, 339-70, S. Korea

SO Bulletin of the Korean Chemical Society (1995), 16(11), 1007-9

CODEN: BKCSDE; ISSN: 0253-2964

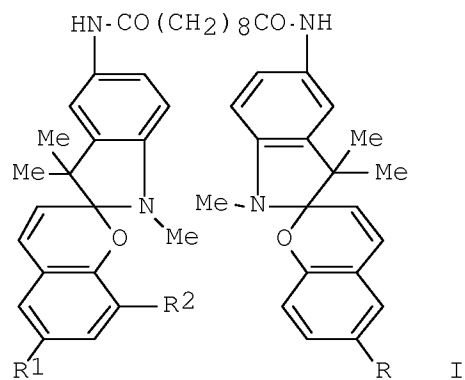
PB Korean Chemical Society

DT Journal

LA English

OS CASREACT 124:59068

GI



AB The title dyes (I; R = H, Me; R1 = NO2, I; R2 = H, I, NO2) were prepd. by treating N,N'-bis[5-(2-methylene-1,3,3-trimethylindoline)]sebacamide with salicylaldehyde and its derivs.

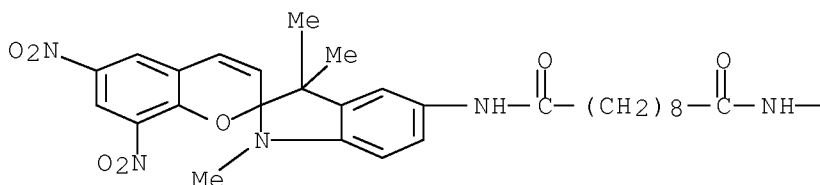
IT 172272-86-5P

(effective method for synthesis of new photo- and thermochromic unsym. bisindolinospirobenzopyran dyes)

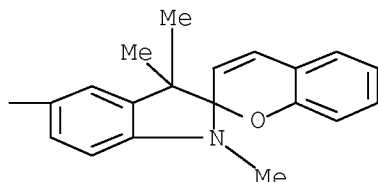
RN 172272-86-5 HCA

CN Decanediamide, N1-(1',3'-dihydro-1',3',3'-trimethyl-6,8-dinitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-5'-yl)-N10-(1',3'-dihydro-1',3',3'-trimethylspiro[2H-1-benzopyran-2,2'-[2H]indol]-5'-yl)- (CA INDEX NAME)

PAGE 1-A



PAGE 1-B



IT 172272-86-5P

(effective method for synthesis of new photo- and thermochromic unsym. bisindolinospirobenzopyran dyes)

OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L40 ANSWER 3 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 112:186305 HCA Full-text

OREF 112:31369a,31372a

TI Formation of head-to-tail and side-by-side aggregates of photochromic spiropyrans in bilayer membrane

AU Seki, Takahiro; Ichimura, Kunihiro

CS Res. Inst. Polym. Text., Tsukuba, 305, Japan

SO Journal of Physical Chemistry (1990), 94(9), 3769-75

CODEN: JPCHAX; ISSN: 0022-3654

DT Journal

LA English

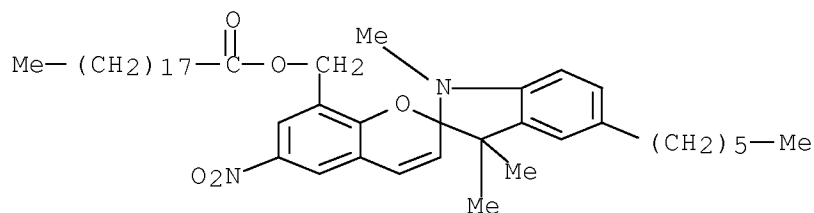
AB Aggregation phenomenon and **thermal isomerization** behaviors of photochromic spiropyran (SP) compds. in dioctadecyldimethylamonium (2C18N+2Cl) bilayer membrane are reported. Spiropyran compds. having 2 alkyl chains form J-aggregate (head-to-tail) or H-aggregate (side-by-side) in the bilayer when they are converted to the merocyanine form by UV light (PMC). The type of the aggregate depends on the chem. structure of this photochromic mol. One type of PMC forms J-aggregate (J-PMC) at the mixing molar ratio of the spiropyran to 2C18N+2Cl (R) of >0.1, and the other type forms H-aggregate (H-PMC) at R >0.2. It is suggested in comparison with other isotropic media that an orientation effect of the anisotropic environment formed by the bilayer is essential for the controlled aggregate formation. J-PMC is stable in the bilayer regardless of the crystal .dblarw. liq. crystal phase change, and H-PMC, on the other hand, is formed only in the crystal (gel) phase. Aggregation retards the rate of the **thermal isomerization** (PMC → SP) to large extents, depending on the aggregation type. For the first time, the aggregation phenomenon of photochromic spiropyran compds. were obsd. in the bilayer matrix.

IT 126062-50-8

(aggregation of, in bilayer membranes)

RN 126062-50-8 HCA

CN Nonadecanoic acid, (5'-hexyl-1',3'-dihydro-1',3',3'-trimethyl-6-nitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-8-yl)methyl ester (CA INDEX NAME)



IT 126062-50-8

(aggregation of, in bilayer membranes)

OSC.G 33 THERE ARE 33 CAPLUS RECORDS THAT CITE THIS RECORD (33 CITINGS)

L40 ANSWER 4 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 112:129229 HCA Full-text

OREF 112:21709a,21712a

TI **Thermochromic** recording materials

IN Fujimura, Yasuo; Sakai, Isoji; Yamaoka, Tsugio; Koseki, Kenichi

PA Nitto Denko Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

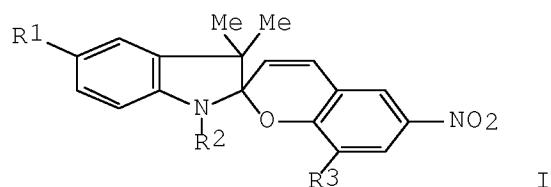
CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO. -----	KIND ----	DATE -----	APPLICATION NO. -----	DATE -----
PI	JP 01226387	A	19890911	JP 1988-53317	19880307
PRAI	JP 1988-53317		19880307		
GI					



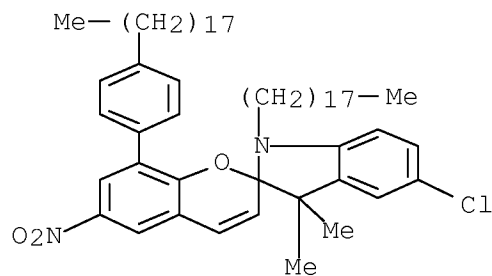
AB Spiropyran compds. I (R1 = H, halo, alkyl, alkoxy, alkoxy carbonyl; R2 = alkyl, alkanoyloxymethyl, alkoxy, alkoxy carbonyl, alkoxy carbonyl alkyl, carboxyalkyl, hydroxyalkyl, alkylphenyl with C8-30 C chain; R3 = H, or C1-30 groups as defined for R2) and polymers that dissolves or disperses I. Reversible coloring and color elimination are carried out, with or without n-paraffin additives. Thus, a 1- $\mu$ m recording layer was formed on a glass substrate by coating a soln. contg. 0.2 g spiropiran compd. I (R1 = H, R2 = C18H37, R3 = CH2OCOC21H43) and 1 g PMMA, and drying. Irradn. of the plate with 365 nm UV light produced stable absorption max. at 618 nm, and thermal recording on this plate (130-140°, 0.1 s) eliminated this absorption. Instead, the plate exposed to UV produced uniform 580-nm absorption, and recording with thermal head at 40° gave stable intense absorption at 618 nm, which was eliminated thermally as in the former example.

IT 118855-07-5 118855-08-6 118855-13-3  
 118879-64-4 125677-42-1 125677-43-2  
 125677-44-3 125698-90-0

(thermochromism of light-sensitive, reversible optical recording materials contg.)

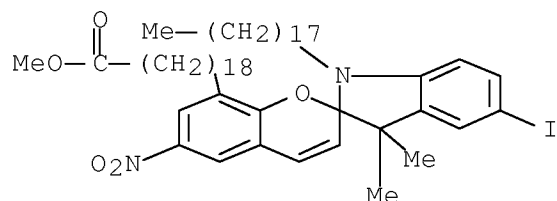
RN 118855-07-5 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 5'-chloro-1',3'-dihydro-3',3'-dimethyl-6-nitro-1'-octadecyl-8-(4-octadecylphenyl)- (CA INDEX NAME)



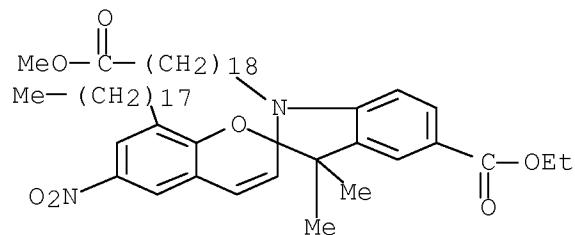
RN 118855-08-6 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-8-nonadecanoic acid,  
1',3'-dihydro-5'-iodo-3',3'-dimethyl-6-nitro-1'-octadecyl-, methyl  
ester (CA INDEX NAME)



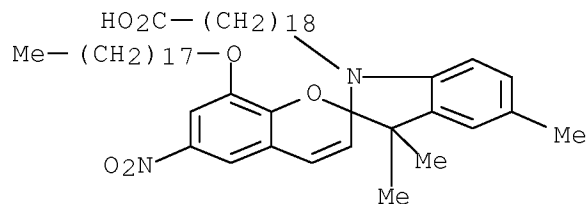
RN 118855-13-3 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-nonadecanoic acid,  
5'-(ethoxycarbonyl)-3',3'-dimethyl-6-nitro-8-octadecyl-, methyl ester  
(CA INDEX NAME)



RN 118879-64-4 HCA

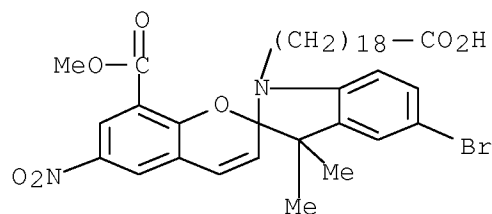
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-nonadecanoic acid,  
3',3',5'-trimethyl-6-nitro-8-(octadecyloxy)- (CA INDEX NAME)



RN 125677-42-1 HCA

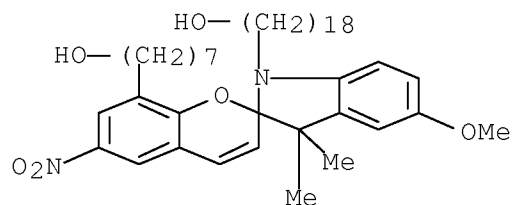
CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-1'(3'H)-nonadecanoic acid,

5'-bromo-8-(methoxycarbonyl)-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



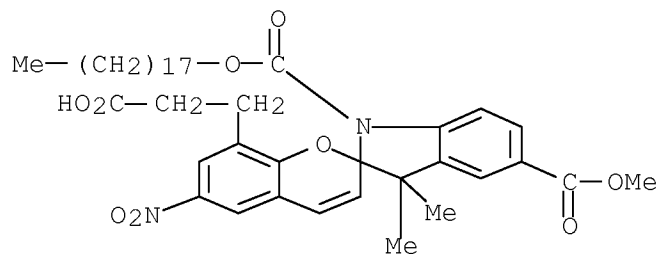
RN 125677-43-2 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole]-1'(3'H)-octadecanol,  
8-(7-hydroxyheptyl)-5'-methoxy-3',3'-dimethyl-6-nitro- (CA INDEX  
NAME)



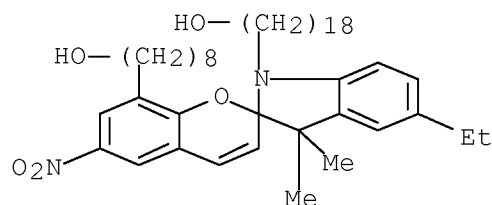
RN 125677-44-3 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole]-1',5'(3'H)-dicarboxylic acid,  
8-(2-carboxyethyl)-3',3'-dimethyl-6-nitro-, 5'-methyl 1'-octadecyl  
ester (CA INDEX NAME)



RN 125698-90-0 HCA

CN Spiro[2H-1-benzopyran-2,2'-(2H)indole]-1'(3'H)-octadecanol,  
5'-ethyl-8-(8-hydroxyoctyl)-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



IT 118855-07-5 118855-08-6 118855-13-3  
 118879-64-4 125677-42-1 125677-43-2  
 125677-44-3 125698-90-0

(thermochromism of light-sensitive, reversible optical  
 recording materials contg.)

OSC.G 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L40 ANSWER 5 OF 5 HCA COPYRIGHT 2010 ACS on STN

AN 109:8008 HCA Full-text

OREF 109:1481a,1484a

TI The structure of open merocyanine forms of photochromic indoline  
 spiropyrans and the mechanism of their structural conversions

AU Aldoshin, S. M.; Atovmyan, L. O.

CS Inst. Chem. Phys., Chernogolovka, 142432, USSR

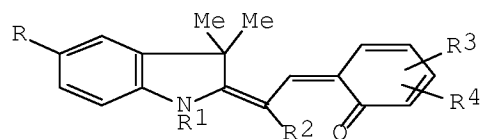
SO Molecular Crystals and Liquid Crystals (1987), 149, 251-90

CODEN: MCLCA5; ISSN: 0026-8941

DT Journal

LA English

GI



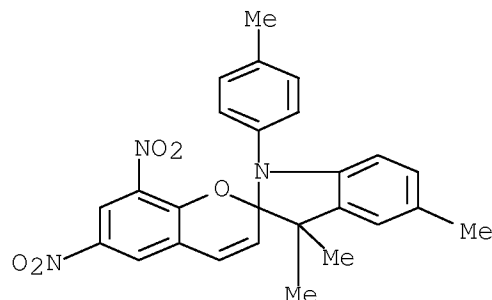
I

AB Structural studies of open merocyanine forms (I; R,R2 = H, Me; R1 = H, Me,  
 n-pentyl, p-tolyl; R3,R4 = Br, NO2) of photochromic indoline spiropyrans are  
 reported. Structural factors stabilizing spiropyrans in the open state are  
 discussed. The mol. and crystal structures of these compds. are discussed  
 in detail as well as the intermol. interaction energy in their crystals and  
 the thermal stability of various isomers. A proposed photoconversion  
 mechanism of spiropyrans is shown.

IT 114866-03-4 114866-04-5

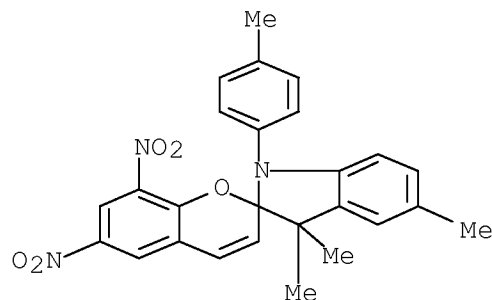
(mol. and crystal structure of, photochem. ring opening of  
 photochromic spiropyrans in relation to)

RN 114866-03-4 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-3',3',5'-trimethyl-1'-(4-methylphenyl)-6,8-dinitro-,  
 hydrate (1:1) (CA INDEX NAME)



● H<sub>2</sub>O

RN 114866-04-5 HCA  
 CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
 1',3'-dihydro-3',3',5'-trimethyl-1'-(4-methylphenyl)-6,8-dinitro- (CA  
 INDEX NAME)



IT 114866-03-4 114866-04-5  
 (mol. and crystal structure of, photochem. ring opening of  
 photochromic spiropyrans in relation to)  
 OSC.G 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)

=> D L46 10,20,30,40,50,60,70,80,90,100 BIB ABS FHITSTR HITRN

L46 ANSWER 10 OF 102 HCA COPYRIGHT 2010 ACS on STN  
 AN 127:42374 HCA Full-text  
 OREF 127:7955a,7958a

TI Preparation of spiropyrane derivatives as reversible photochromic substance for reversible recording media

IN Minami, Masato; Matsuo, Hiroyuki; Taguchi, Nobuyoshi

PA Matsushita Electric Industrial Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 11 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

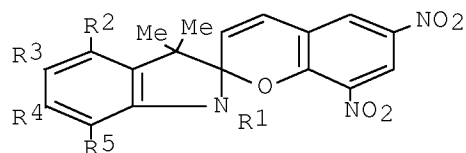
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	JP 09124654	A	19970513	JP 1995-284867	19951101

PRAI JP 1995-284867 19951101

OS MARPAT 127:42374

GI



I

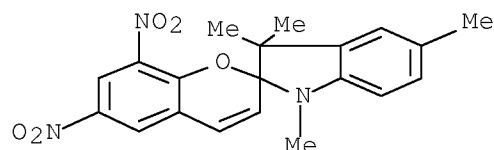
AB The title compds. (I; R1 = C1-11 alkyl, aryl, methacrylamide, etc.; R2-R5 = H, OH, alkyl, NH2, NO2, etc.) are prepd. I, having excellent contrast of color development and decolor, light resistance, and reversible properties, are useful for reversible recording media. Thus, 1,3,3-trimethyl-2-methylene-5-methoxyindoline was refluxed with 3,5-dinitrosalicylaldehyde in EtOH for 5 h to give 92% I (R1 = Me, R3 = OMe, R2 = R4 = R5 = H) (II). A recording medium contg. II is prepd. and tested.

IT 179017-84-6P

(prepn. of spiropyrane derivs. as reversible photochromic substance for reversible recording media)

RN 179017-84-6 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-1',3',3',5'-tetramethyl-6,8-dinitro- (CA INDEX NAME)



IT 179017-84-6P 179017-85-7P 179017-86-8P

179017-87-9P 179017-90-4P 189685-28-7P  
189685-30-1P 189685-33-4P 189685-35-6P  
189685-38-9P 189685-40-3P

(prepn. of spiropyrane derivs. as reversible photochromic substance  
for reversible recording media)

L46 ANSWER 20 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 122:68027 HCA Full-text

OREF 122:12787a,12790a

TI Oxidative degradation of organic photochromes

AU Malatesta, Vincenzo; Milosa, Mario; Millini, Roberto; Lanzini, Luigi;  
Bortolus, Piero; Monti, Sandra

CS EniChem Synthesis, San Donato Milanese, 20097, Italy

SO Molecular Crystals and Liquid Crystals Science and Technology, Section  
A: Molecular Crystals and Liquid Crystals (1994), 246,  
303-10

CODEN: MCLCE9; ISSN: 1058-725X

DT Journal

LA English

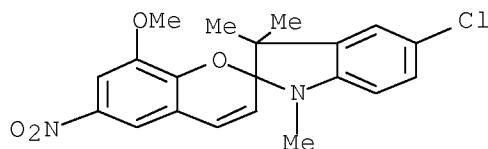
AB Photooxidn. of some representative spiropyrans and spirooxazines does not  
seem to involve singlet oxygen O<sub>2</sub>(<sup>1</sup>Δg). The photochromes rather behave, in  
the spiro and merocyanine form, as O<sub>2</sub>(<sup>1</sup>Δg) quenchers. Only a  
methoxynitrobenzopyran deriv. were found to promote formation of singlet  
oxygen. Superoxide anion O<sub>2</sub><sup>-</sup> is likely the activated oxygen species  
responsible for their oxidative photodegrdn.

IT 14994-04-8

(role of singlet oxygen in oxidative degrdn. of photochromic  
spiropyrans and spirooxazines)

RN 14994-04-8 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
5'-chloro-1',3'-dihydro-8-methoxy-1',3',3'-trimethyl-6-nitro- (CA  
INDEX NAME)



IT 14994-04-8

(role of singlet oxygen in oxidative degrdn. of photochromic  
spiropyrans and spirooxazines)

OSC.G 12 THERE ARE 12 CAPLUS RECORDS THAT CITE THIS RECORD (12  
CITINGS)

L46 ANSWER 30 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 118:158025 HCA Full-text

OREF 118:26911a,26914a

TI Photochromic spiropyran compound for optical recording material  
 IN Hibino, Junichi; Moriyama, Kumiko; Kishimoto, Yoshio  
 PA Matsushita Electric Industrial Co., Ltd., Japan  
 SO Eur. Pat. Appl., 17 pp.  
 CODEN: EPXXDW

DT Patent  
 LA English

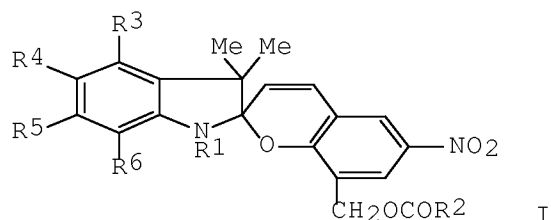
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	EP 502506	A1	19920909	EP 1992-103693	19920304
	EP 502506	B1	19951025		
	JP 05072668	A	19930326	JP 1992-41252	19920227
	JP 2975761	B2	19991110		
	US 5426018	A	19950620	US 1993-152952	19931115
PRAI	JP 1991-63969	A	19910304		
	US 1992-842909	B1	19920227		

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

OS MARPAT 118:158025

GI

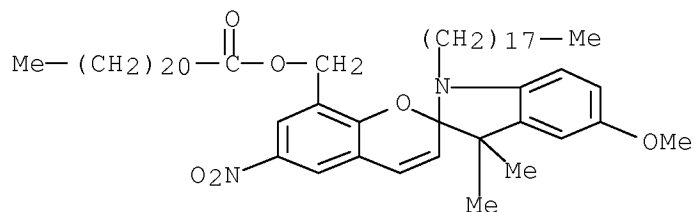


AB A photochromic spiropyran compd. represented by the formula I (R1, R2 = alkyl having 1-30 C atoms; R3-6 = H, amino, alkoxy having 1-5 C atoms, or alkylamino having 1-5 C atoms with the proviso that  $\geq 1$  of R3-6 is amino, alkoxy, or alkylamino) is capable of forming 2 kinds of aggregates, each having a sharp absorption peak at a different wavelength, with different binding agents and used in a multilayer laser optical recording material for recording different images using different-frequency lasers.

IT ~~146429-38-1~~  
 (multilayer multifrequency photochromic laser recording materials contg.)

RN 146429-38-1 HCA

CN Docosanoic acid, (1',3'-dihydro-5'-methoxy-3',3'-dimethyl-6-nitro-1'-octadecylspiro[2H-1-benzopyran-2,2'-[2H]indol]-8-yl)methyl ester (CA INDEX NAME)



IT 146429-38-1 146429-40-5

(multilayer multifrequency photochromic laser recording materials contg.)

OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L46 ANSWER 40 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 114:63173 HCA Full-text

OREF 114:10845a,10848a

TI Two-dimensional poling of organic and polymer films for improved nonlinear-optical properties

AU Yitzchaik, Shlomo; Berkovic, Garry; Krongauz, Valeri

CS Dep. Struct. Chem., Weizmann Inst. Sci., Rehovot, 76100, Israel

SO Optics Letters (1990), 15(20), 1120-2

CODEN: OPLEDP; ISSN: 0146-9592

DT Journal

LA English

AB Nematic org. and polymeric films doped with mols. of high nonlinear polarizability can exhibit two-dimensional asymmetry after elec.-field poling along one direction only. Consequently, these films exhibit more nonzero components of the second-order susceptibility tensor than are obtained through usual poling techniques. These films can exhibit very high nonlinear optical coeffs. (close to  $10^{-7}$  esu/cm<sup>3</sup>) and retain most of their nonlinearity one week after removal of the poling field.

IT 131621-36-8

(two-dimensional poling of doped films of, for improved nonlinear optical properties)

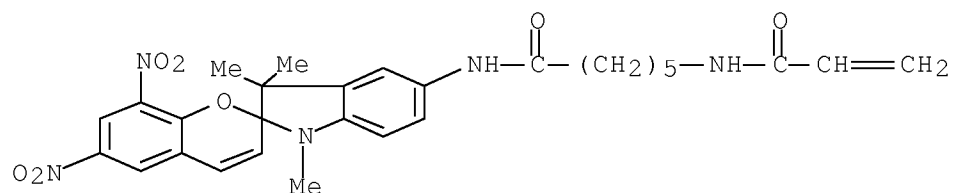
RN 131621-36-8 HCA

CN Benzoic acid, 4-[[6-[(1-oxo-2-propenyl)oxy]hexyl]oxy]-, 4-cyanophenyl ester, polymer with N-(1',3'-dihydro-1',3',3'-trimethyl-6,8-dinitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-5'-yl)-6-[(1-oxo-2-propenyl)amino]hexanamide (9CI) (CA INDEX NAME)

CM 1

CRN 131621-35-7

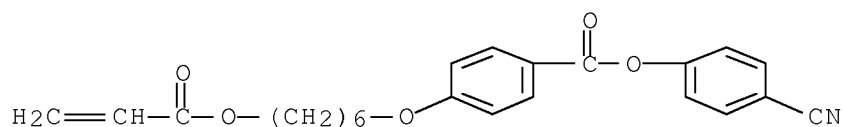
CMF C28 H31 N5 O7



CM 2

CRN 83847-14-7

CMF C23 H23 N O5



IT 131621-36-8

(two-dimensional poling of doped films of, for improved nonlinear optical properties)

OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L46 ANSWER 50 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 108:111462 HCA Full-text

OREF 108:18241a,18244a

TI Heat-induced configuration inversion of the closed form of indolinospirans

AU Zaichenko, N. L.; Marevtsev, V. S.; Arsenov, V. D.; Cherkashin, M. I.

CS Inst. Khim. Fiz., Moscow, USSR

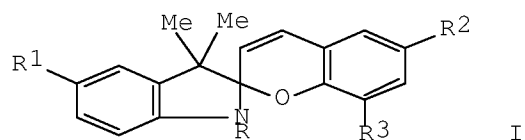
SO Khimicheskaya Fizika (1987), 6(8), 1126-31

CODEN: KHFID9; ISSN: 0207-401X

DT Journal

LA Russian

GI



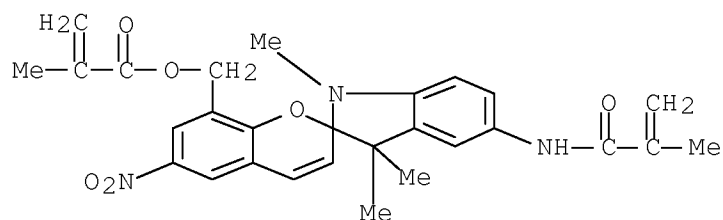
AB Free energies of activation ( $\Delta G_{\text{thermod.}}$ ) of configuration inversion in title compds. I [R = Me, Ph, CH<sub>2</sub>CH<sub>2</sub>OH, (alkenoyloxy)ethyl; R<sub>1</sub> = H, NO<sub>2</sub>, methacrylamido; R<sub>2</sub> = H, OH, CHO, NO<sub>2</sub>, CO<sub>2</sub>Me, Br, CO<sub>2</sub>H; R<sub>3</sub> = H, OMe, NO<sub>2</sub>, Br, allyl, CO<sub>2</sub>Me, CO<sub>2</sub>H, (methacryloyloxy)methyl] generally ranged from 16 to 25 kcal/mol. Linear plots of  $\Delta G_{\text{thermod.}}$  were obtained vs. substituent const. combinations. Electron-withdrawing substituents in the indoline moiety increased  $\Delta G_{\text{thermod.}}$ ; when in the benzopyran moiety they decreased  $\Delta G_{\text{thermod.}}$ .

IT 82000-96-2

(configuration inversion in, kinetics of)

RN 82000-96-2 HCA

CN 2-Propenoic acid, 2-methyl-, [1',3'-dihydro-1',3',3'-trimethyl-5'-[(2-methyl-1-oxo-2-propen-1-yl)amino]-6-nitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-8-yl)methyl ester (CA INDEX NAME)



IT 82000-96-2

(configuration inversion in, kinetics of)

OSC.G 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L46 ANSWER 60 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 97:144065 HCA Full-text

OREF 97:23985a,23988a

TI Reaction of thermal decoloration of indolinospiropyrans in a plasticized polystyrene matrix

AU Arsenov, V. D.; Cherkashin, M. I.

CS Inst. Khim. Fiz., Moscow, USSR

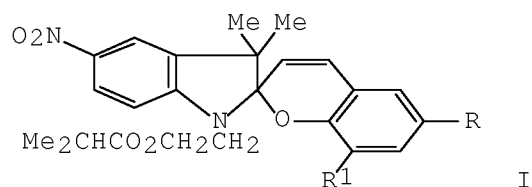
SO Izvestiya Akademii Nauk SSSR, Seriya Khimicheskaya (1982), (6), 1268-71

CODEN: IASKA6; ISSN: 0002-3353

DT Journal

LA Russian

GI

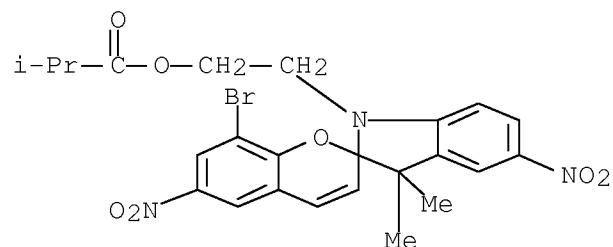


AB The photochromic behavior of I (R = Br, R1 = NO2; R = NO2, R1 = Br) in a polystyrene matrix is characterized by 3 relaxation times. Upon long UV irradiation, a redistribution of the contributions of the relaxation processes occurs owing to decomposition of I. Plasticization of the polystyrene matrix with di-Bu phthalate increases the rate of photocoloration and thermal decoloration of I.

IT ~~82828-49-7~~  
(photochromism of, in plasticized polystyrene matrixes)

RN 82828-49-7 HCA

CN Propanoic acid, 2-methyl-, 2-(8-bromo-1',3'-dihydro-3',3'-dimethyl-5',6-dinitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-1'-yl)ethyl ester  
(CA INDEX NAME)



IT ~~82828-49-7~~  
(photochromism of, in plasticized polystyrene matrixes)

L46 ANSWER 70 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 89:214593 HCA [Full-text](#)

OREF 89:33329a,33332a

TI Effect of proton donors on the dark disappearance of a photoinduced form of spiropyrans

AU Kasparova, I. Ya.; Zubkov, A. V.; Gerasimenko, Yu. E.

CS Nauchno-Issled. Inst. Org. Poluprod. Krasitelei, Moscow, USSR

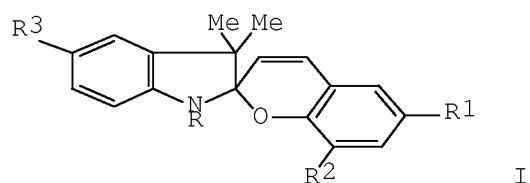
SO Kinetika i Kataliz (1978), 19(4), 872-6

CODEN: KNKTA4; ISSN: 0453-8811

DT Journal

LA Russian

GI



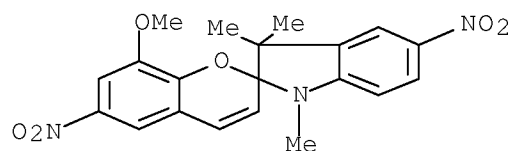
AB Proton donors (HCl, PhOH, BzOH, EtOH) accelerated the cyclization of the ring-opened form of I (R = Me, Ph; R1 = Cl, Br, NO2; R2 = H, Cl, Br, NO2, OMe; R3 = H, F, Cl, NO2) back to the closed form. A configurational change was involved in the process. Rate consts. were listed.

IT 6427-76-5

(dark cyclization of open form of, effect of proton donors on)

RN 6427-76-5 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole],  
1',3'-dihydro-8-methoxy-1',3',3'-trimethyl-5',6-dinitro- (CA INDEX  
NAME)



IT 6427-76-5 14994-04-8 20178-65-8

(dark cyclization of open form of, effect of proton donors on)

L46 ANSWER 80 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 78:117643 HCA Full-text

OREF 78:18855a,18858a

TI Spiropyran photochromic materials

IN Inoue, Eiichi; Kobayashi, Hajime; Kodado, Hiroshi; Shimizu, Isamu;  
Takahashi, Yonsuke

PA Canon K. K.

SO Jpn. Kokai Tokkyo Koho, 5 pp.  
CODEN: JKXXAF

DT Patent

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 47027189	B4	19721027	JP 1971-18937	19710330

GI For diagram(s), see printed CA Issue.

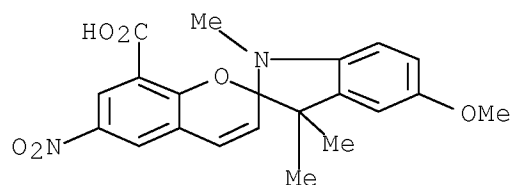
AB Photochromic compns. contg. spiropyrans (I R1 = Me, Et, Ph; R2 = Cl-5 alkoxy; and R3 = H, NO2) are described. Thus, a polyester film support coated (10  $\mu$  thickness) with a soln. of poly(vinyl alc.) contg. 5 wt. % I (R1 = Me, R2 = OMe, and R3 = H) (yellow orange colored) was exposed 2 min through a positive to a 500-W lamp at 40 cm to give a decolored pos. image. The imaged material recovered its original color after standing 4.5 hr in the dark.

IT 41572-55-8

(photochromism of, in poly(vinyl alcohol))

RN 41572-55-8 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-8-carboxylic acid, 1',3'-dihydro-5'-methoxy-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



IT 41572-55-8

(photochromism of, in poly(vinyl alcohol))

L46 ANSWER 90 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 74:4686 HCA Full-text

OREF 74:751a,754a

TI Photochromic 5,5"-methylenebis[spiro(indoline-2,2'-2'H-chromenes)]

IN Ono, Hisatake; Osada, Chiaki; Katsuyama, Harumi

PA Fuji Photo Film Co., Ltd.

SO Ger. Offen., 18 pp.

CODEN: GWXXBX

DT Patent

LA German

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	DE 2012687	A	19700924	DE 1970-2012687	19700317
	JP 49045064	B	19741202	JP 1969-20657	19690318
	GB 1304042	A	19730124	GB 1970-12800	19700317
	BE 747554	A	19700831	BE 1970-747554	19700318
	FR 2039667	A5	19710115	FR 1970-9728	19700318
	US 3714187	A	19730130	US 1970-20761	19700318
PRAI	JP 1969-20657	A	19690318		

GI For diagram(s), see printed CA Issue.

AB The title compds. (I, R = H, CH2OH, or CH2CO2H; R1 = H, OMe, CHO, or Vr; R2 = H, NO2 or Br), prepd. by reaction of II with 2,3,5-HOR1R2C6H2CHO, give colorless solns. which become blue on uv irradiation and again colorless on storage in the dark. Also coatings, prepd. from I and polystyrene, on poly(ethylene terephthalate) films have this photochromic effect. Thus,

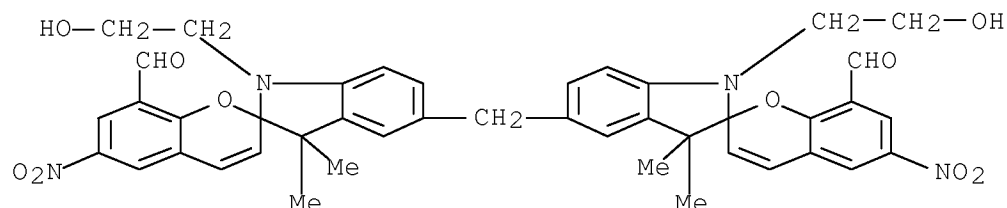
refluxing II (R = H, X = p-MeC6H4SO3) and 2,5-HO(O2N)C6H3CHO in EtOH for 30 min gave I (R = R1 = H, R2 = NO2). An addnl. 6 I were prepd. similarly.

IT 30125-59-8P

(prepn. of)

RN 30125-59-8 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-8-carboxaldehyde,  
5'-[[8-formyl-1',3'-dihydro-1'-(2-hydroxyethyl)-3',3'-dimethyl-6-  
nitrospiro[2H-1-benzopyran-2,2'-[2H]indol]-5'-yl]methyl]-1',3'-dihydro-  
1'-(2-hydroxyethyl)-3',3'-dimethyl-6-nitro- (CA INDEX NAME)



IT 30125-59-8P 30267-17-5P 30267-18-6P

(prepn. of)

L46 ANSWER 100 OF 102 HCA COPYRIGHT 2010 ACS on STN

AN 64:69057 HCA Full-text

OREF 64:12972b-c

TI Photochromic coatings

IN Foris, Peter L.

PA National Cash Register Co.

SO 25 pp.

DT Patent

LA Unavailable

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	BE 658272		19650430	BE	
	GB 1030217			GB	

PRAI US 19640116

GI For diagram(s), see printed CA Issue.

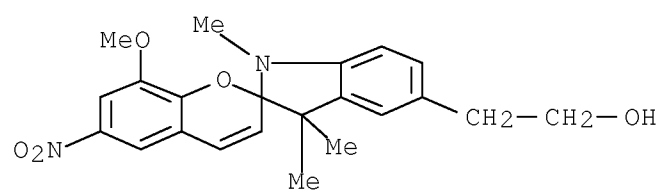
AB Solns. of a photochromic compd. (in the nonpolar form), such as a benzoindolino-spiropyran in a solvent (in which the polar photochromic compd. is insol.), are applied on a substrate, such as a Sn oxide or SiO2, and the materials are irradiated to give coatings that are resistant to acids and solvents. Thus, a thin Cu plate is treated with 10% I (C6H6) and exposed to uv rays (375-400 mμ).

IT 7410-37-9, Spiro[2H-1-benzopyran-2,2'-indoline]-5'-ethanol,  
8-methoxy-1',3',3'-trimethyl-6-nitro-

(photochromy-polarity-soly. relations of)

RN 7410-37-9 HCA

CN Spiro[2H-1-benzopyran-2,2'-[2H]indole]-5'-ethanol,  
1',3'-dihydro-8-methoxy-1',3',3'-trimethyl-6-nitro- (CA INDEX NAME)



IT 7410-37-9, Spiro[2H-1-benzopyran-2,2'-indoline]-5'-ethanol,  
 8-methoxy-1',3',3'-trimethyl-6-nitro-  
 (photochromy-polarity-soly. relations of)